CALIFORNIA ENERGY COMMISSION
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June 18, 2002

REQUEST FOR COMMENTS ON THE ENERGY COMMISSION STAFF'S PRELIMINARY DRAFT POWER PLANT COOLING OPTIONS REPORT FOR THE EL SEGUNDO POWER REDEVELOPMENT PROJECT

Enclosed is a copy of the Energy Commission staff's Preliminary Draft Cooling Options Report for the El Segundo Power Redevelopment Project (ESPR). The final version will be an appendix to the staff's biological resources section of the Supplement to the Staff Assessment (SA) which is expected to be issued in late July 2002.

We request that you review the enclosed draft analysis and provide any written comments to James W. Reede, Jr., the Energy Commission's Project Manager by **June 25, 2002**. There will be a workshop held on June 26, 2002 at the El Segundo City Hall Council Chambers from 3 PM until 7 PM, 350 Main Street, El Segundo, to discuss issues related to this draft report. Post-workshop comments are due by **June 28, 2002**.

Purpose of Analysis

The proposed once-through cooling system for the project would use large quantities of water (207mgd), pulling cooled water from the Santa Monica Bay and returning almost all of the water, warmed, to the Bay. This analysis of power plant cooling options at ESPR was undertaken for two reasons. First, staff has identified potential adverse impacts to aquatic biological resources that would result from the proposed use of once-through cooling. Secondly, the California Environmental Quality Act requires that an analysis of feasible alternatives be considered prior to taking action on the proposed project. Therefore, this report will support the Energy Commission's impact analysis under CEQA.

This draft report analyzes the potential impacts of two cooling technologies: once-through cooling system utilizing reclaimed water and a hybrid (wet/dry) cooling system. The once-through cooling system would utilize reclaimed water from the Hyperion Wastewaster Treatment Plant instead of seawater, and the hybrid system (also called a plume abated wet/dry system) would also use reclaimed water for cooling. A 100% wet cooling system is described but not considered because the use of wet cooling without plume abatement (which is included in the hybrid design) would create frequent visible vapor plumes given the climate conditions in El Segundo.

Summary of Conclusions

The disciplines in which potential impacts from reclaimed once-through cooling and hybrid cooling technologies are of most concern are air quality, biological resources, cultural resources, hazardous materials management, public health, noise, visual resources, land use, waste management, water & soil resources, worker safety & fire protection, power plant efficiency and reliability. For air quality and biological resources, impacts of reclaimed once-through cooling would be different than those of seawater once-through cooling but mitigation is feasible and available to reduce impacts to less than significant levels. Visual impacts of the hybrid cooling system would be significant and unmitigable from several viewpoints. As a result of the visual impacts, hybrid cooling would also create land use incompatibility.

Reclaimed once-through cooling and hybrid cooling technologies are less efficient than seawater once-through cooling when used in cooling steam, power generation is slightly reduced using these technologies. Also, additional electricity is required to operate the cooling fans so net power generation is reduced for that reason as well. These reductions in efficiency are found to be small (.5 to 6% for reclaimed once-through cooling and 1% for hybrid cooling). These reductions have been determined not to cause significant adverse impacts on the availability of fuel or to cause wasteful or inefficient energy consumption.

Further Information

If you want information on how you can participate in the Energy Commission's review of the project, please contact Ms. Roberta Mendonca, the Energy Commission's Public Adviser, at (916) 654-4489 (toll free in California at (800) 822-6228), or by email at pao@energy.state.ca.us. Technical or project schedule questions should be directed to James W. Reede, Jr., Siting Project Manager, in the Energy Facilities Siting and Environmental Protection Division, at (916) 653-1245, or by email at jreede@energy.state.ca.us. A copy of the report, the status of the project, copies of notices and other relevant documents are also available on the Energy Commission's Internet web page at **www.energy.ca.gov/sitingcases/elsegundo.** News media inquiries should be directed to Assistant Executive Director, Claudia Chandler, at (916) 654-4989.

Sincerely,

James W. Reede, Jr.
Energy Facilities Siting Project Manager

Enclosure
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PRELIMINARY DRAFT
EL SEGUNDO POWER REDEVELOPMENT PROJECT
COOLING OPTIONS REPORT

1 INTRODUCTION

PURPOSE OF REPORT

The El Segundo Generating System (ESGS) has been operating as an electric generating station since May 1955. The facility currently consists of four gas-fired, conventional electric power-generating units. The proposed project will involve the complete demolition and removal of Units 1 and 2 on the project site, except for the steam cycle heat rejection system that utilizes water from Santa Monica Bay. Upon completion of the demolition and removal of Units 1 and 2, a new combined cycle power plant is to be constructed on the site with the addition of Units 5, 6, and 7 in the location previously occupied by Units 1 and 2. No changes to the existing Units 3 and 4 are proposed in this AFC process. A combined cycle configuration will be established with the addition of heat recovery steam generators to exhaust outlets of Units 5 and 7 and the addition of a Unit 6 steam turbine generator.

Currently, the cooling water supply for the ESGS is provided by two separate ocean intakes from Santa Monica Bay. One existing ocean intake serves Units 1 and 2 (Outfall No. 001) and another serves Units 3 and 4 (Outfall No. 002). Units 3 and 4 would continue to use the second existing seawater intake (Outfall No. 002) to provide cooling water.

The proposed once-through cooling system for the El Segundo Power Redevelopment (ESPR) Project would use large quantities of water, pulling cool water from the Santa Monica Bay and returning almost all of the water, warmed, to the Bay. This analysis of cooling options for ESPR was undertaken because staff has identified potentially significant impacts to aquatic biological resources that would result from the proposed use of once-through cooling.

This report analyzes the feasibility and potential impacts of two cooling technologies: once-through cooling using reclaimed water and hybrid (wet/dry) cooling system using reclaimed water.

AQUATIC BIOLOGY IMPACTS OF CONCERN

The ESPR proposes to use up to 207 million gallons per day (mgd) of seawater for cooling. This water would be brought to the facility by an existing intake pipeline with its terminus 2,600 feet offshore. Staff has identified potentially significant *direct* and *cumulative* adverse aquatic biology impacts from the once-through seawater cooling system at the ESPR Project, related to entrainment and impingement by the intake, and the temperature effects of the thermal discharge. Staff's current analysis of these impacts will be included in the Biological Resources Section of the Staff Assessment Supplement that is planned for publication in late July and is summarized below.

The volume of ocean water which the ESRP Project proposes to withdraw from Santa Monica Bay is approximately three times greater than the average volume being withdrawn at the existing intake when the Application for Certification was filed with the Energy Commission. No biological impact analysis involving sound scientific sampling at the existing El Segundo once-through cooling system intake has ever been done, and none of the “proxy” studies submitted by the Applicant (to demonstrate that the intake will not have a significant impact on marine resources) provide a scientifically reliable estimate of the number of organisms that would be entrained or impinged by the project.

The thermal effects of the proposed project on marine life, viewed in isolation, are expected to be insignificant, and direct thermal discharge impacts on other biological resources are also expected to be insignificant. However, some plankton organisms, which have limited mobility, may be carried into the area of high temperatures surrounding the outfall and would not be able to avoid water temperatures above their tolerance limits. The impacts to plankton of exposure to extreme temperatures will clearly add to the direct adverse impacts of entrainment and impingement cause by the intake. Viewed collectively, the direct impacts of the proposed project’s entire once through cooling system (including the thermal impacts) may be significant.

In addition, the adverse entrainment, impingement and thermal impacts of the proposed once-through cooling system on nearshore fish populations in Santa Monica Bay will add to the adverse impacts of entrainment, impingement and thermal discharge at the other Santa Monica Bay power plants (Scattergood Generating Station and Redondo Generating Station) that draw water from the ocean for their cooling water systems. Staff has determined that the *cumulative* impacts on marine resources will be significant.

COOLING OPTIONS EVALUATED

As a result of the aquatic biological information summarized above, this analysis of options to once-through cooling has been prepared. This report evaluates the environmental and engineering effects (including LORS compliance) of two types of cooling systems:

1. The first cooling system is the use of reclaimed water (rather than seawater) for the once-through cooling system to cool the steam turbine. Treated reclaimed water would be provided from the Hyperion Water Treatment Plant (WTP). The use of both tertiary and secondary treated water is evaluated. Discharge options for the both types of cooling water include (a) discharge via the existing outfall; (b) a split discharge, with half directed to the existing outfall and half directed to the existing intake pipe; and (c) return of cooling water to the Hyperion WTP for disposal through its existing offshore discharge pipe. The engineering and environmental effects of once-through cooling using reclaimed water are presented in Section 4. The use of reclaimed water in a once-through cooling system appears to be technically feasible and potential impacts, especially at the higher flowrates, are likely to be mitigable to less than significant levels.

2. The second system considered is the use of hybrid cooling towers. This report considers the potential noise, visual, and air quality impacts of this option. The visual, noise and air quality LORS implications of this option (especially as related to the California Coastal Commission and City of Manhattan Beach requirements) are evaluated in Section 5. This option would require reconfiguration of major site components including the relocation and/or re-design of two facilities (the retention basin and the proposed new administration building) and revisions to the vegetation plan. These changes may themselves result in significant noise and visual impacts. The suggested configuration would have impacts to visual resources, noise, and air quality, but these impacts are believed to be mitigable to less than significant levels.

REPORT CONTENTS

This report includes six sections that include the information shown below.

1. Introduction
Section 1 describes the purpose of the report, a brief description of the aquatic biology impacts of concern, the cooling options that are reviewed in this report, and the report contents.

2. Background on Cooling Options
Section 2 provides an overview review of the types of cooling technologies that exist for combined cycle power plants. It describes the basic technologies and how they work, where the technologies are currently used, and the advantages and disadvantages of each.

3. Conceptual Design of Cooling Options for the ESPR Project
Section 3 presents conceptual designs for the specific cooling options that could replace or enhance the once-through cooling system proposed for ESPR that are considered in this report. This section presents a description of reclaimed water cooling systems that could be used with once-through cooling (one using secondary treated water and one using tertiary treated water and discharge options for each). A conceptual design is also presented for hybrid cooling towers.

4. Environmental and Engineering Analysis of Once-Through Cooling Using Reclaimed Water
Section 4 analyzes the environmental and engineering effects of the cooling options and the alternative locations for each of the issue areas that would be substantially affected (e.g., air quality, aquatic biology, visual, etc.).

5. Environmental Analysis of Hybrid Cooling
This section describes the land use, visual, noise, and air impacts of hybrid cooling at the ESPR site.

6. Conclusion: Comparison of Cooling Options
Section 6 presents overall conclusions about the environmental and engineering effects of the cooling options.

2 BRIEF DESCRIPTION OF COOLING TECHNOLOGIES

Thermal power plants convert fuels (such as natural gas) to electrical power and waste heat. In combustion turbines, or Brayton cycles, almost all the waste heat is rejected in the exhaust gases. In steam turbines, or Rankine cycles, waste heat is rejected in the flue gases and in the condenser/cooling system. Operation of the cooling system for steam turbines serves three purposes: (1) condensing steam into water to allow pumping of a liquid instead of compressing a gas to raise the feedback to the boiler to high pressures; (2) recycling of the water back to the boiler to optimize water use; and (3) minimizing the steam turbine exhaust temperature to maximize the output of the steam turbine. The temperature of the heat sink and the heat transfer efficiency of the cooling system affect the overall plant performance.

Steam turbine cooling can be achieved by using any of at least three technologies. In once-through cooling, large quantities of water are used for cooling and the heated water is then returned to its source. Wet cooling towers use water and evaporative cooling, using less than 10 percent of the water needed for once-through cooling. Dry cooling uses ambient air for cooling, and requires construction of large banks of elevated fans, almost eliminating water demand. Hybrid cooling combines elements of wet and dry cooling (evaporative cooling and fans) and can be configured in many different ways.

In this study, dry cooling is not considered because it requires a large surface area for the banks of fans, and this space is not available at ESGS. Wet cooling is not evaluated because wet towers create large vapor plumes in coastal climates. Wet or hybrid cooling can also use seawater rather than fresh or reclaimed water. Saltwater cooling towers are not evaluated in this study because the purpose of the study was to minimize impacts to the marine environment.

Therefore, this study considers (1) once-through cooling using reclaimed water rather than seawater (seawater was proposed by the Applicant); and (2) hybrid cooling using reclaimed water.

ONCE-THROUGH COOLING USING RECLAIMED WATER

Description of the Process and Equipment Required

Historically, power plants have been built along the coast or on large rivers to make use of seawater or other open waters for cooling. Once-through cooling using open water has low capital and operating costs and potential for high power plant operating performance (i.e., lower temperature heat sink), so it is still favored by plant developers. In once-through cooling, water is drawn from a local source (e.g., the ocean), passed through the condenser tubes, and returned to the ocean at a higher temperature. Although large volumes of water are required, once-through cooling does not consume water; it uses the water briefly and returns the water at an elevated temperature. Steam is condensed in a shell-and-tube condenser.

Existing once-through cooling power plants facilities utilize seawater or other open water sources for cooling. The use of reclaimed water would not generally require additional equipment at the power plant itself. However, pipelines from a source of reclaimed water would need to be constructed and would need to connect to existing intake systems.

Current Use of Once-Through Cooling Using Reclaimed Water

While reclaimed water is commonly used in hybrid cooling towers, staff is not aware of power plants that currently use reclaimed water for once-through cooling. Very few water treatment plants have capacity large enough that once-through cooling could be considered.

Advantages and Disadvantages of Once-Through Cooling Using Reclaimed Water

The following is a general list of the advantages and disadvantages of once-through cooling using reclaimed water.

Advantages of Once-Through Cooling Using Reclaimed Water

- Impingement and entrainment impacts on marine biological resources are eliminated.
- Reclaimed water that would otherwise be directly discharged to the ocean has a beneficial use prior to discharge.
- Tertiary or secondary treated water used for cooling could be available to other users.
- The provider of the reclaimed water, West Basin Municipal Water District, would presumably receive income from the sale of treated water to the plant operator.

Disadvantages of Once-Through Cooling Using Reclaimed Water

- Cooling efficiency is less than with seawater because reclaimed water is warmer.
- Reclaimed water may not be readily available in all areas in the large quantities required, and the supply may not be as reliable a source as seawater even if sufficient quantities are identified.
- The volume of reclaimed water used will depend on economic optimizations, but is likely to be less than the volume of seawater proposed. This would result in a higher discharge temperature that, when discharged directly to the ocean, may result in increased thermal impacts to aquatic species, potentially raising questions concerning discharge requirements.
- The plant operator must purchase reclaimed water while seawater is available at no fiscal cost (though there is an environmental cost).
- An additional large pipeline (connecting the power plant with the water treatment plant) must be constructed.

HYBRID COOLING

Description of the Process and Equipment Required

Hybrid cooling systems combine wet and dry cooling technologies. The two primary hybrid systems are water conservation and plume abatement designs. These hybrid systems can vary depending on the project-specific situation and objectives.

Water conservation designs reduce water usage for plant heat rejection. Water is primarily used during the hottest periods of the year to reduce the large losses in steam cycle capacity and plant efficiency that occur with all-dry systems. The hybrid water conservation systems can limit water use to between 5 and 80 percent of that required for once-through cooling while achieving substantial efficiency and capacity advantages during the peak load periods of hot weather as compared with dry systems. If more water is available, it can be used to further increase plant efficiency.

The most common type of hybrid system is the hybrid plume abatement system. Plume abatement towers may be designed primarily to eliminate visible plume, and thus fall outside the range that might otherwise be achieved, for a 2 to 5% water conservation. Plume abatement towers are very similar to wet cooling towers, but they also add a small amount of dry cooling to dry out the tower exhaust plume during cold, high-humidity days, thus eliminating condensed moisture plumes when the plumes would be very visible. Depending on their design, the hybrid plume abatement towers can save an additional 2 to 5 percent of the water quantity saved in conventional wet cooling tower systems when compared against once-through cooling. The goal of the plume abatement towers is to achieve high plant efficiency similar to the wet cooling towers, but with reduced plumes. Plume abatement hybrid cooling towers have been used since the 1970s with proven reliability.

Current Use of Hybrid Cooling

COOLING OPTIONS Table 1 lists recent power plant applications to the CEC and shows the type of cooling proposed for each plant.

EL SEGUNDO COOLING OPTIONS Table 1
Recent Operational and Approved Combined Cycle Power Plants

	Project Name	MW	County	Cooling Method	Water Source
Operational	GWF Hanford Peaker	96	Kings	Wet tower	Fresh water
	Los Medanos	559	Contra Costa	Wet tower	**Reclaimed water**
	Sunrise Combined Cycle	320	Kern	Wet tower	Fresh water
	Sutter Power	540	Sutter	Dry tower	None
Under Construction	Blythe Energy	520	Riverside	Wet tower	Fresh water
	Contra Costa Repower	530	Contra Costa	Wet tower	**Recycled water**
	Delta Energy Center	880	Contra Costa	Wet tower	**Reclaimed water**
	Elk Hills	500	Kern	Wet tower	Fresh water
	High Desert	720	San Bernardino	Wet tower	Fresh water
	Huntington Beach Repower	450	Orange	Once through	Ocean water
	La Paloma	1048	Kern	Wet tower	Fresh water
	Metcalf	600	Santa Clara	Wet tower	**Reclaimed water**
	Moss Landing Expansion	1060	Monterey	Once through	Ocean water
	Mountainview	1056	San Bernardino	Wet tower	**Blended reclaimed water**
	Otay Mesa	510	San Diego	Dry tower	Dry cooling
	Three Mountain Power	500	Shasta	Wet/dry tower	Hybrid wet/dry
	Western Midway Sunset	500	Kern	Wet tower	Fresh water

Source: California Energy Commission, April 2002

Advantages and Disadvantages of Hybrid Cooling

The following is a general list of the advantages and disadvantages of hybrid cooling systems.

Advantages of Hybrid Cooling Systems

- Water conservation hybrid systems use between 5 and 80 percent of the water consumed by wet cooling towers, and use only 1 to 3 percent of water consumed by once-through cooling
- Once a hybrid cooling system is filled, water is withdrawn from the environment for the wet portion only.
- Hybrid cooling systems are more efficient than all-dry cooling systems; they can reach “wet bulb” temperatures in the wet portion of the system. These wet bulb temperatures are lower than “dry bulb” temperatures.

- When use of seawater is not environmentally desirable and a limited supply of fresh or recycled water is available for cooling, hybrid-cooling systems present a viable and feasible alternative.

Disadvantages of Hybrid Cooling Systems

- Like wet cooling systems and once-through cooling, hybrid cooling requires a dependable source of water.
- Although more efficient than dry cooling, hybrid cooling systems are not as efficient as once-through or wet cooling.
- Requires water treatment and monitoring to control concentrations of impurities in the wet portion of the system.
- Can produce water vapor plumes that have negative visual effects unless plume abatement cooling towers are used.
- Capital costs for hybrid systems are generally higher than for conventional wet systems. Maintenance costs are higher than for dry systems.
- Requires large cooling towers that could have negative visual and noise effects, as well as greater air emissions.
- Compared to once-through cooling, hybrid-cooling systems require the disturbance of upland areas for installation of the wet cooling towers.

3 DESIGN OF COOLING OPTIONS FOR THE EL SEGUNDO POWER PLANT

INTRODUCTION

ESPR proposes to use 207 mgd from three potential sources at full operation. Nearly all of this water would be used for cooling the steam turbine condenser. Cooling water would be seawater drawn through the existing ESGS intake structure. Potable water would be purchased from the City of El Segundo, through purchases from the Metropolitan Water District (MWD) (about 180,000 gallons per day), and additional water would be purchased from the West Basin Municipal Water District (WBMWD) for irrigation of landscaping and other uses (about 86,000 gallons per day).

Two different alternative cooling methods are evaluated in this report for the ESPR Project. The first would use once-through cooling with reclaimed water. Two water sources are considered, both from the Hyperion WTP: secondary[1] and tertiary[2] treated water. Three discharge options are evaluated for both water types: (1) discharge

[1] The process for secondary water treatment removes biodegradable organics and suspended solids, using chemical and/or biological processes.

[2] Tertiary treated water is treated to drinking water standards, requiring additional treatment, including disinfection to kill any microorganisms that might cause disease. This disinfection can be done with chemical (e.g., chlorine) or physical (e.g., microfilters) processes or a combination of both.

through the existing ESGS discharge structure; (2) discharge split between the existing ESGS intake and discharge structures; and (3) discharge via the existing Hyperion WTP outfall.

The second technology considered is hybrid cooling with the wet cooling towers using reclaimed water. A dry cooling component would be used in the cooling tower for plume abatement.

ONCE-THROUGH COOLING USING RECLAIMED WATER

In order to evaluate the feasibility and potential impacts of eliminating the use of seawater for cooling, staff analyzed the use of reclaimed water from the Hyperion WTP. The conceptual designs presented here call for ESPR to take delivery of 70 to 150 mgd of reclaimed water at the Hyperion WTP. Water use is reduced from the Applicant's proposed 207 mgd because a higher discharge temperature has been assumed. In one option this water would be returned to the Hyperion WTP after its use for cooling and in other options discharged directly from the existing power plant discharge and/or intake structures. The potential impacts of the higher discharge temperatures on marine organisms are addressed in Section 4 of this report.

The City of Los Angeles' Hyperion WTP treats sewage from the City's collection system and provides secondary treatment. Treated water is then discharged at a point five miles offshore. The treatment capacity of the Hyperion WTP is 450 mgd; the ESPR requirement (up to 150 mgd) would only be 33 percent of its discharge capacity, and could potentially rise to 40 percent of actual output during hot months of the year. Currently, 6% of Hyperion's secondary treated water (28 mgd) is delivered for reuse to its only customer, West Basin Municipal Water District. The maximum flow through the Hyperion outfall is 700 mgd pump-assisted.

The actual flow requirements for once-through cooling would have to be determined by ESPR, based on specific economic optimizations. In the analysis presented in this report, an attempt has been made to 'bracket' the requirements; i.e., the study's engineering calculations conclude that such optimizations would result in flow requirements greater than 70 mgd but less than 150 mgd. The same amount of heat must be dissipated in either case. The smaller amount of water results in a higher discharge temperature (70 mgd would result in a discharge temperature of 125°F) and the greater water volume results in a lower discharge temperature (150 mgd would result in a discharge temperature of 95°F).

There are two options for the type of reclaimed water that could be used at ESPR: tertiary treated water and secondary treated water. Each of these two types of water could be discharged in three ways: through existing ESGS structures (two discharge options, defined below), or through Hyperion's discharge structure. **COOLING OPTIONS Figure 1** presents a map of the pipeline route from the Hyperion WTP to the ESPR Project.

Option 1: Tertiary Treated Water Discharged Through Existing ESGS Structures

The new ESPR units could theoretically use either secondary or tertiary treated water from the Hyperion WTP for cooling in lieu of seawater for cooling. However, because this option would result in discharge to the ocean that would be relatively near shore (2,000 to 2,600 feet offshore), discharge of secondary treated water is not evaluated with this discharge option. Use of tertiary treated water would require construction of a tertiary treatment facility and a pumping system at or near the Hyperion WTP as part of the ESPR project. The tertiary treatment facility could require a minimum of 5 acres of land. From this new facility, the treated reclaimed water would be pumped approximately one mile south to the power plant in a new pipeline.

It is assumed that the pipeline would be bored under Vista del Mar, from Hyperion on the east to the west side of the road. It would then parallel the west side of the road, continuing to the power plant's northern border. The pipe would be approximately six feet in diameter, either concrete or plastic; being buried in the sand it would be able to withstand hydraulic forces, and minimal pressure would be required for pumping. The trench for construction would be on the order of 9 or 10 feet wide. Allowing space for temporary spoil laydown and shovel access during construction would result in an expected right-of-way of about 30 feet in width.

Inside the power plant boundary, the pipe would deliver treated water to the existing intake structure. It is assumed that the reclaimed water would be received will vary between 72 and 88°F with seasonal variation during the year, based on preliminary information received from West Basin Municipal Water District (WBMWD) and Hyperion.

The approximate cost of this option would be about $250 million. This includes the cost of an approximately 5,000-foot pipeline (assuming a cost of $1,000/foot), a tertiary treatment facility and pumping system as well as various business costs, permitting, etc. This estimated cost would be about 50 percent of the plant cost, which is not considered to be a reasonable project capital cost.

An additional cost factor is the reclaimed water itself. The WBMWD reports that the "published rate" for tertiary treated water is $200 to $250 per acre-foot. At the lower expectation of 70 mgd, this would result in the use of 78,000 acre-feet per year (AFY). At $200 per acre-foot, this would result in a cost of $15 million per year. At 150 mgd, the cost would be about $30 million per year. This is a substantial portion of the cost of the entire plant. However, given the high volume of water required, it is possible that the cost could be negotiated with the WBMWD to a much lower rate.
Two discharge options could be used for discharge of tertiary treated cooling water, Option 1A and Option 1B. Each is described below.

Option 1A: Tertiary Treatment Discharge Using Existing Outfall

The condenser discharge could be directed to the existing outfall, which is approximately 1,990 feet offshore. The discharge volume would be between 35 and 72 percent of the planned discharge of the proposed project. The temperature of the discharged treated water would be higher than for the proposed project. Using the lowest flow (35 percent of the proposed project, or 70 mgd), the discharge temperature would be 125°F. Use of the middle flow (53 percent of the proposed project or 110 mgd) the discharge temperature would be 105°F and for the highest flowrate (150 mgd, 72 percent of proposed), the discharge temperature would be 95°F. Implementation of this option will result in the abandonment of Intake 001.

Option 1B: Tertiary Treatment Discharge Using Existing Outfall and Existing Intake

If Option 1A results in unacceptable impacts to the marine environment due to the high water temperatures, another option would be the use of <u>both</u> the intake and discharge systems for discharge of cooling water. This could be done because the existing intake structure would no longer be needed (water would be provided via pipeline from the Hyperion WTP).

In Option 1B, the discharge flow would be split. About half of the discharge would be directed to the existing intake pipe, which can be separated from the intake structure that would receive the incoming reclaimed water. The other half would be directed to the existing outfall. This would require modification of the intake structure, but has two advantages:

- It would spread the discharge plume to two locations. The pipe previously used for intake has a "velocity cap", which will cause a different dispersion pattern than typically experienced. Also the original intake is 2,600 feet offshore versus 1,990 for the old discharge, providing an advantage in keeping temperature effects away from the beach.
- It would maintain a flow in the intake pipe, keeping it clear of marine organisms, specifically the large growth of black mussels, which can expand very rapidly. This will avoid having to demolish or permanently protect or cap the pipe.

Option 2: Secondary or Tertiary Treated Water Discharged Using the Hyperion Discharge Structure

The Hyperion WTP currently discharges secondary treated water through its five-mile discharge pipe to the ocean. ESPR could use either tertiary or secondary treated water for cooling, and then return the warmed water to Hyperion for disposal through its existing discharge pipe. This option would require construction of a second pipeline from Hyperion to ESPR (one pipeline would transport water in each direction), and it would eliminate Option 1's use of the existing pipes for discharge.

Either secondary or tertiary treated water could be used at ESGS for cooling. The only difference between the two would be the required tertiary treatment system added at

Hyperion. This option is presented because of the potential for operational needs or permit requirements to make it necessary.

This option would result in heated water (95 to 125°F) being returned to Hyperion for discharge. Ocean discharge of heated water is a concern, as current discharge from Hyperion varies from between 72 to 75°F in the winter and 85 to 88°F during the summer months (May-September). Currently the El Segundo plant has heat treatment discharges of 105°F water for a few hours on a monthly basis. The temperature of the water discharged by Hyperion at its outfall (five miles offshore) can not be calculated until more detailed Hyperion flow values are obtained. This discharge would consist of a mix of current discharge at 72 to 88°F and return flow from ESGS at 95 to 125°F, and would likely be 80 to 90°F when the ESPR is operating at full load using a 150 mgd cooling flow. Based on the increased discharge temperature, a new or revised National Pollutant Discharge Elimination System (NPDES) permit may be required for Hyperion's discharge.

If secondary treated water were used, this scenario would eliminate the costs associated with a new tertiary treatment system and the higher cost differential of tertiary treated water versus secondary treated water. A second parallel pipeline would cost significantly less than the tertiary treatment option. A $20 million capital outlay would be adequate to cover pipelines, a basin or tankage and connections in and out of the discharge line. This estimated cost would be about 1 percent of the plant cost, which is considered to be a reasonable project capital cost.

An additional cost factor is the reclaimed water itself. The WBMWD reports that they do not have a "published rate" for secondary treated water. The rate of $200 to $250 per acre-foot for tertiary treated water would be inappropriate to use as a basis for estimates. Given the high volume of water required, it is possible that the cost could be negotiated with the WBMWD to a much lower rate. At the lower expectation of 70 mgd, this would result in the use of 78,000 acre-feet per year (AFY). Assuming $100 per acre-foot, this would result in a cost of $7.8 million per year. At 150 mgd, the cost would be about $15 million per year. These costs are considered reasonable operating costs.

HYBRID COOLING USING RECLAIMED WATER

System Design

The design and operation of a hybrid cooling system is highly dependent upon the ambient conditions at the specific site location. Because this analysis is intended only to evaluate the feasibility of hybrid cooling at the ESGS site, a detailed site-specific design has not been developed. The hybrid system described here is considered to be a typical plume-abated design for a coastal power plant.

The hybrid cooling alternative would consist of a combination wet cooling tower with a dry section mounted on top for purposes of abating the visible vapor plume that would occur during periods of cool, high humidity weather. The concept of this design is to use the wet portion of the tower to provide a primary cooling source for the cooling water that is circulated through the plant condensers and then a dry portion to reheat the exiting air to a temperature above which a vapor plume will not form.

A hybrid configuration for cooling the proposed ESPR project would require water to makeup losses through evaporation, drift, and blowdown from the tower. As water passes over the wet portion of the hybrid tower, some of it will be evaporated and thus require replacement. Additionally, due to the evaporation losses the remaining water will increase in mineral content, which would eventually deposit on the tower reducing its effectiveness. To avoid this a portion of the water is discharged or blown down and replaced with treated reclaimed water. Also, some of the water is lost as a mist (called "drift") that is carried up as a result of the airflow through the tower. By use of specifically designed drift eliminators, this loss is reduced to 0.0005 percent of the cooling water flow. The sum of these losses must be made up with the addition of the treated reclaimed water. The source of makeup water would be from the Hyperion WTP.

Size, Configuration, and Layout

The configuration of a hybrid cooling tower combines finned tube heat exchangers, dry sections and conventional evaporative cooling, or wet sections using fans to draw the air through the tower. Air is drawn in parallel through both the air-cooled section and the evaporative section. As the air passes through the wet section of the tower it picks up moisture. If the moisture in the air reaches saturation it forms a vapor and a plume becomes visible, which can be eliminated by mixing the moist air with dry air from the dry section, thus keeping it from becoming saturated. Therefore, the tower consists of a lower wet section where water droplets are passed over fill material, and finned tubes above. From a distance the tower appear much like a radiator. On top of these sections is the deck where the fans are located within housings that extend above the deck.

The size of the hybrid-cooling tower is a function of the heat load and the ambient conditions at the site. For the ESGS site, the tower would be a total of approximately 500 feet long by 50 feet wide and approximately 56 feet high to the fan deck and 70 feet to the top of the fan housing. The tower would consist of 10 fans approximately 30 to 32 feet in diameter that would draw air up through the wet and dry sections of the cooling tower. Each fan services one cell of the cooling tower.

The ESGS property has very limited availability of level land due to the topography of the coastal site. While the largest level space would be where the fuel oil tanks are currently located, the cooling towers are not proposed in that location because they would be adjacent to the residences south of the plant property. The resulting noise and visual impacts of cooling towers in that location would be unacceptable. Therefore, the next most logical place for the cooling towers would be where the Administration building is currently located, also affecting a portion of the existing retention basin, which would need to be redesigned to meet permit requirements. This location is illustrated in **COOLING OPTIONS Figure 2**). The Applicant is proposing to demolish the Administration building and construct a new one in its current location, so with this configuration, the Administration building would have to be relocated, most likely to a portion of the tank farm area. The tank farm area is currently proposed as construction laydown area for the new units, so the potential relocation of the Administration building to that area would create additional design challenges for the Applicant. Detailed design for this option is beyond the scope of this conceptual report, but this conceptual design is presented for environmental analysis regardless of the acknowledged site constraints. Given the site constraints, the configuration of the 10 cells would be:

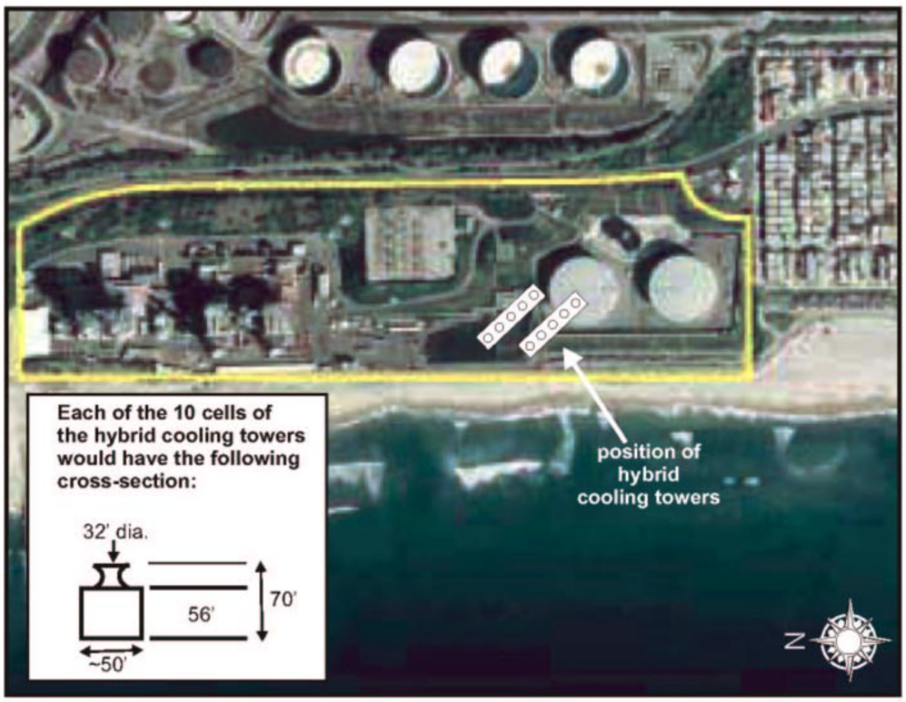
a. Splitting the 10 cell cooling tower into two elements consisting of five towers each, each element being about 250 feet long by 50 feet wide. The cooling towers would be 70 feet high, and the existing base elevation of the site location would be somewhat below the level of the residences adjacent to the southern boundary line.

b. Locating one of the two tower structures in the area that is now occupied by the retention basin and administration building, and positioning both towers at a 45-degree angle to a north-south line; one corner northwest, the other southeast.

This plan would locate the nearest cooling tower at least 400 feet from the southern boundary of the plant, which is adjacent to residences.

A hybrid-cooling tower would require less water to accomplish the needed cooling function than once-through cooling using reclaimed water. For this option, a flow volume of less than 4 mgd would be required, compared to 70 to 150 mgd for once-through cooling using reclaimed water, and over 200 mgd of seawater. The specific chemical analysis required for detailed cooling tower design is not available, but making a conservative assumption that a circulation ratio of 6 would be adequate, then a cooling tower blowdown flow rate of less than 1 mgd would be needed. Accomplishing this flow volume would be possible with a supply pipe of approximately 18 inches in diameter and a blowdown pipeline of 12 inches, compared to a 6- to 8-foot diameter pipelines required for the once-through options.

Figure 2: Possible Location of Hybrid Cooling Towers



Besides the required relocation of the Administration building and redesign of the retention basin, this option would also require the challenging routing of the two large-diameter (6 feet or more) circulating water pipes from the cooling towers to the plant, a distance of approximately 1,500 feet. The pipes would have to cross from north of existing Units 3 and 4 to the south of these units, including the intake and outfall pipes from Units 3 and 4. It is assumed in this analysis that the pipeline would run along the east property line. The length of the pipeline is not considered to be a concern for pumping this volume of water.

The hybrid cooling option would require the use of tertiary treated water because of the aerosol release of water droplets from the cooling tower, even though the release of aerosol would be limited by the plume abatement feature of the design.

An additional disadvantage associated with the hybrid option would be the thermal performance of the power plant on hot days. Under some weather conditions, the circulating water temperature would be a few degrees higher than the 72 to 88°F provided by the Hyperion reclaimed water.

Options for the disposition of the cooling tower blowdown include return to the Hyperion WTP, discharge to the local sewer, or discharge to the existing outfall, which would be substantially oversized for this service. For purpose of the study it is assumed that the blowdown would be returned to Hyperion.

Efficiency of Hybrid Cooling

The higher condenser back pressure and corresponding loss of power generated by the steam turbine plus the additional auxiliary loads from the fans and water pumping requirements would reduce the efficiency of the overall power generation cycle for the hybrid system. The measure of power plant efficiency is the comparison of the amount of fuel required to generate a kilowatt-hour of electricity. Using the proposed once-through case as the basis for comparison, the plant will burn 191,664 pounds per hour of natural gas at the summer design point using supplemental duct firing. The fuel use is measured in British Thermal Units or Btus therefore the units used to portray the efficiency of a power plant are Btus per kWh. This is identified as the plant heat rate.

Generally, a combined cycle plant like ESPR would have a net plant heat rate of approximately 7,000 Btu/kWh. Assuming this as the base for the once-through design and assuming an equivalent fuel consumption for the wet/dry cooling alternative, the heat rate of the plant would increase reflecting a decrease in efficiency due to lower net output of the ESPR. This lower output is caused by a the combination of reduced steam turbine generator output due to the higher condenser back pressure, the greater auxiliary loads due to the requirement of the wet/dry cooling tower fans and the additional pumping requirements for delivery of the makeup water. The power requirements for the pumping load associated with delivery of the reclaimed water have not been included in this estimate since it is unknown at this time if it will be included with the agreement to provide the water. Thus the new plant heat rate is estimated to be approximately 7068 Btu/kWh or an increase of approximately 1 percent.

Cost

An order-of-magnitude capital cost estimate for the hybrid alternative would be about $16 million above the cost of the proposed ocean water system. Capital costs in this assessment include:

- Plume abatement cooling tower (two sections of five cells each)
- Expanded reclaimed water supply and return piping to WBMWD
- Large-diameter circulating water pipe from the cooling tower to the steam turbine condenser
- Supporting mechanical, electrical, and civil structures and installation.

No allowance is made for cost of capital or other indirect costs.

Routine operation and maintenance costs for the hybrid system would include chemical treatment required. There is routine maintenance required for the fans, motors, and gearboxes. The finned tubes may need periodic cleaning and touchup, or repainting of the equipment and structure would be performed. Estimated operation and maintenance cost of the hybrid alternative is approximately $300,000 per year.

4 ENVIRONMENTAL AND ENGINEERING ANALYSIS OF ONCE-THROUGH COOLING USING RECLAIMED WATER

The following subsections describe the environmental and engineering impacts of once-through cooling using reclaimed water. The analyses include an evaluation of the use of tertiary treated water with discharge either through the existing plant discharge pipe or with discharge split between the existing intake and discharge pipes. Secondary treated water with discharge via Hyperion's existing outfall is also evaluated. The areas relating to Transmission Line Safety and Nuisance, Facility Design, and Geology and Paleontology were deemed to have no impacts and are not included in further analysis.

AIR QUALITY

General Impacts of Using Reclaimed Water

Once-through cooling systems are closed systems and therefore do not emit air pollution. As a result, the only air emissions from the once-through use of reclaimed (tertiary or secondary treated) water from the Hyperion WTP facility will be from the construction of the required water pipelines. The applicant will be required to comply with the Energy Commission construction conditions to minimize construction related air emissions.

Option 1: Tertiary Treatment, Discharge at ESGS

El Segundo Power proposes to construct 1.9 miles of reclaimed and potable water pipelines, 200 feet of sanitary discharge line, and 0.5 mile of aqueous ammonia supply line. It is likely that the construction emissions from these pipelines will be similar to the emissions expected from the proposed tertiary treated water line from the Hyperion WTP. The maximum pipeline construction emissions are presented in **EL SEGUNDO COOLING OPTIONS Table 2:**

EL SEGUNDO COOLING OPTIONS Table 2
Estimated Emissions for Pipeline Construction

Pollutant	Maximum Daily Emission (lbs/day)
NOx	117.82
VOC	8.91
CO	41.45
Sox	4.06
PM10	7.03
Fugitive PM10	8.53

The air emissions that have the potential to cause a significant impact on the ambient air quality are the PM10 emissions. The impact assessment was performed with the understanding that the location of the maximum impact is unknown since the construction activity moves along the linear. Based on the modeling of construction activities at the project site, the estimated impact from the tertiary water pipelines is 73.1 µg/m^3 of PM10. Adding this to the background measurement of 69 µg/m^3 gives a total impact of 142.1 µg/m^3 or approximately 284 percent of 24-hour PM10 California Ambient Air Quality Standard, and very near the PM10 National Ambient Air Quality Standard of 150 µg/m^3. If left unmitigated, staff would consider this a significant impact.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

The above estimate of air quality impacts would be similar for the once-through use of secondary or tertiary treated water, returned to Hyperion for discharge.

Conclusion for Air Quality

The use of reclaimed water (secondary or tertiary treated) in the once-through cooling system would produce potentially significant impacts resulting from pipeline construction. Mitigation to less than significant levels may be possible but would require evaluation of specific information regarding construction equipment, scheduling, and dust control measures.

TERRESTRIAL BIOLOGICAL RESOURCES

General Impacts of Using Reclaimed Water

Two reclaimed water options are evaluated with respect to the once-through cooling method to determine their effects on terrestrial biological resources. The proposed project site and ancillary facilities are located in a highly industrialized area, with the exception of the adjacent marine environment of Santa Monica Bay.

Historically, terrestrial habitat at and adjacent to the ESPR site may have included sand beach, southern dune scrub, coastal salt marsh and coastal sand dune habitat adjacent to the Bay. Today, only small, isolated patches of natural vegetation and associated wildlife remain as a result of heavy industrial development of the area, including a few small areas of ornamental plantings (i.e., palm trees) immediately to the east of the existing ESGS boundary and isolated patches of ruderal vegetation such as grasses, thistles and other weedy species. Consequently, few wildlife species are supported on the site or adjacent, vegetated habitats. Urban birds are most common and include pigeons, mourning doves, starlings, and house sparrows. None of these birds are considered protected species or are listed by the California Department of Fish and Game or the U.S. Fish and Wildlife Service.

In the Staff Assessment, **Biological Resources Table 1,** provides a list of sensitive species that may be found in the terrestrial environment of the Project area; however it is unlikely that any of these species would persist within the project site or adjacent areas given the highly disturbed and fragmented nature of the habitat. Exceptions to this are two sensitive habitat areas located at the Chevron Preserve approximately 0.3 miles northeast of the Power Plant site, and the El Segundo Dunes Preserve located approximately 1.5 miles north-northwest of the site. Both areas provide habitat to the El Segundo blue butterfly (*Euphilotes battoides allyni*), a federally listed endangered species. In the Staff Assessment, Staff concluded that there would be no significant impacts to terrestrial biological resources, including federal or state endangered or threatened species.

Option 1: Tertiary Treatment, Discharge at ESGS

In this scenario, a tertiary treatment facility and a pumping system would need to be constructed at or near the Hyperion WTP to serve the ESPR project. From this new facility, the treated reclaimed water would be pumped via a pipeline, which would extend one mile south to the power plant.

Staff assumes that the pipeline would be bored from the Hyperion WTP under Vista del Mar (a street that runs parallel to the coast), and then the pipeline would run parallel to the road, on its west side, continuing to the power plant's northern border. Although the pipeline trench is relatively wide, estimated at 9 or 10 feet, the disturbed area would not impact the two blue butterfly habitats located near the Chevron Preserve and the El Segundo Dunes Preserve. Lands west of Vista del Mar along the alignment are generally occupied by off street parking, sidewalks or ruderal (weedy) vegetation. Therefore, there will not be a significant impact to terrestrial biological resources as a result of the construction of a water supply pipeline and the use of tertiary treated water.

There are two wastewater outfall options for the use of the tertiary treated water: (1) use only the existing ESGS outfall; (2) modify the existing intake structure so that the discharge flow would be split between the existing ESGS intake pipe and outfall pipes. Neither of these scenarios would require use of additional land area, so there is no difference in impacts to terrestrial biological resources between these two outfall options. No significant impacts to biological resources are anticipated.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

In this scenario, ESGS would use secondary or tertiary treated water for cooling, and then return the warmed water to Hyperion for disposal through its existing discharge pipe. Hyperion currently discharges secondary treated water through its five-mile discharge pipe to the ocean. This option would require construction of a second pipeline from Hyperion to ESPR (one pipeline would transport water in each direction). It would ostensibly disturb more land for construction than the option for use of tertiary treated water. However, given that there are no significant biological resources located along this alignment and since the pipeline construction routes would not disturb habitat for the federally endangered El Segundo blue butterfly, there would be no significant impacts to terrestrial biological resources as a result of the construction of a second water line and using secondary treated water for power plant cooling.

Conclusion for Terrestrial Biological Resources

The use of reclaimed water in a once-through cooling system at ESPR would not result in any significant impacts to terrestrial biological resources or sensitive species. Overall, the nature and magnitude of the impacts of using reclaimed water would be similar to terrestrial impacts resulting from the proposed project. Because of this, decisions regarding the biological impacts of various water sources for once-through cooling can and should be based entirely on impacts to aquatic, rather than terrestrial biological resources.

MARINE BIOLOGICAL RESOURCES

General Impacts of Using Reclaimed Water

The use of reclaimed water rather than seawater to cool the new Units 5, 6, and 7 of the El Segundo Power Redevelopment Project will eliminate the entrainment of planktonic organisms in the cooling water system and the impingement of fishes and macroinvertebrates on the intake screens. Marine resources may still be affected by the discharge of heated water to the ocean.

Option 1: Tertiary Treatment, Discharge at ESGS

Under this alternative, the ESPR Project would use 70 to 150 mgd of tertiary treated water from the Hyperion WTP. The wastewater would receive tertiary treatment prior to use in ESGS Units 5, 6, and 7 cooling water system. The heated wastewater from cooling Units 5, 6, and 7 would be discharged to the ocean from the El Segundo power plant. Under Option 1A, the water would be discharged through the existing outfall for Units 1 and 2 located approximately 1,990 feet offshore. Under Option 1B, the cooling water would be split; half would be discharged to the ocean from the existing Units 1 and 2 outfall and half would be discharged from the Units 1 and 2 intake, which is located 2,600 feet offshore.

The discharge temperature could be between 95°F (26.3° above the ambient seawater temperature) with a flowrate of 150 mgd, and 125°F (57.2° above seawater temperature with a flowrate of 70 mgd). Based on the analysis provided in the **Soil and Water Resources** section below, at the end of the mixing zone, approximately 100 feet from the discharge, the temperature of the discharge plume would be 11°F above ambient seawater for a flowrate of 150 mgd and 17° above ambient for a flowrate of 70 mgd. The upper lethal temperature for juvenile topsmelt, one of the most temperature tolerant fish species in the nearshore waters of Santa Monica Bay, is approximately 89°F (Emmett et al. 1991). For shiner surfperch, the upper lethal temperature is reported as between 80°F and 86°F (Emmett et al. 1991). Clearly, the temperatures at the discharge point under the range of flowrates that would occur for this cooling option would be above the thermal tolerance of Santa Monica Bay nearshore fishes. Water temperatures in Santa Monica Bay range from a low of about 52°F to a high of about 73°F. Thus, even at a moderate ambient ocean temperature of 65°F, the temperature of the plume 100 feet from the discharge may approach the lethal limit for some fish species under a flowrate of 70 mgd. At the maximum flowrate of 150 mgd, the temperature rise at the edge of the mixing zone would approach the lethal limit only for endemic species during periods of very warm ambient water temperatures (above 70°F). However, adult fishes will actively avoid areas above their thermal preference. Therefore, the relatively small area of very hot water would not be likely to kill adult fishes. Rather, fish would avoid the hottest portions of the plume. Because the warm, fresh wastewater would be less dense than the ambient ocean water, the plume would be expected to rise towards the surface. Therefore, fishes in the upper portion of the water column would be most affected by the elevated temperatures.

Unlike adult fishes, planktonic organisms drift with the currents and have little ability to avoid waters that may be harmful to them. Planktonic organisms that become entrained in the hottest parts of the plume would die.

As described in the **Soil and Water Resources** section below, under the tertiary treated water alternative, the surface area that would be 4°F above the ambient ocean temperature would be 1,000 acres compared to 800 acres for the proposed once-through cooling system at the lowest flowrate of 70 mgd. For the maximum flowrate of 150 mgd, the area of surface water that would be 4°F above ambient would be 860 acres. Thus, under the maximum flowrate, this cooling water option would have thermal effects similar to those of the proposed once-through cooling system. Therefore, under this alternative, use of reclaimed water would result in a similar or greater area than for the proposed seawater cooling system in which fishes sensitive to elevated temperatures might have to avoid the thermal plume.

While an increased area would be affected by the thermal plumes, studies of the response of fishes to the existing discharge (Benson et al. 1973) have noted only minor differences between fish abundance and diversity near the El Segundo Generating Station outfalls compared to areas away from the influence of the thermal plume.

Therefore, the effects of the larger thermal plume that would occur under this alternative compared to the once-through cooling alternative would not be expected to be significant.

The use of tertiary treated water from the Hyperion WTP at ESPR would also reduce the secondary treated discharge from the Hyperion outfall five miles offshore by 33 percent. The reduction in the Hyperion discharge could result in some localized benefits to marine resources in the vicinity of the Hyperion outfall.

As discussed in the **Soil and Water Resources** section below, discharging through both the intake and outfall (Option 1B) would not provide significantly more dilution, because the discharge velocity would be reduced. Retrofitting the Unit 1 and 2 outfall with a small discharge diameter to increase the discharge velocity would increase dilution resulting in a temperature rise at the edge of the mixing zone of 7°F above ambient for a flowrate of 150 mgd and 13°F above ambient for a flowrate of 70 mgd. For a flowrate of 150 mgd, this temperature rise would be similar to the plume from the proposed once-through cooling system. Fish lethal temperatures would only be approached at the edge of the mixing zone under the warmest ambient ocean temperatures (above 70°F) for flowrate of 70 and 110 mgd but would be below the lethal limit for most species at a flowrate of 150 mgd. For a flowrate of 70 mgd, the average temperature rise at the edge of the mixing zone would be 13°F above ambient.

Impacts of discharging tertiary treated water at the Hyperion WTP would be the same as those discussed below for secondary treated water.

Option 2: Tertiary or Secondary Treated Water, Discharge at Hyperion

Under this alternative, tertiary or secondary treated water from the Hyperion WTP would be used to cool ESGS Units 5, 6, and 7. The warmed water would be returned to the Hyperion WTP for discharge via its five-mile outfall. As described in the **Soil and Water Resources** section below, the discharge of the cooling water through the Hyperion outfall would result in a temperature rise of less than 10°F above ambient at the discharge point. The warmer discharge would increase the buoyancy of the Hyperion wastewater plume.

This alternative is expected to have minimal effect on marine resources. The discharge of heated water from the Hyperion outfall might cause some temperature-sensitive fish species to avoid the immediate vicinity of the discharge. Because the Hyperion outfall is located in deeper, cooler water than the El Segundo Generating Station outfall, the Hyperion discharge would only reach temperatures lethal to marine organisms during heat treatments. Because the Hyperion WTP currently has heat treatment discharges of 105°F, the addition of heated wastewater from the El Segundo power plant would only slightly increase discharge temperatures during heat treatments if at all.

Conclusion for Marine Biological Resources

The use of ocean water to cool Units 5, 6, and 7 would result in the loss of billions of fish eggs, larvae and planktonic algae and invertebrates every year through entrainment in the cooling water system. In addition, adult fishes and macroinvertebrates would swim through the intake pipe and become trapped in the forebay. The trapped animals eventually would be killed during heat treatments. Some marine organisms will also be adversely impacted by the project's thermal discharge.

Adverse entrainment, impingement and thermal impacts have the potential to be significant on both a direct and a cumulative basis. Recent entrainment studies done at several California coastal power plants (Moss Landing, Morro Bay, Diablo Canyon, and San Onofre) have found significant *direct* impacts to local marine resources. Furthermore, many southern California nearshore fish species have been in decline since the 1970's (Herbinson et al. 2001; Love, Caselle, and Van Buskirk 1998). Thus, *cumulative* adverse entrainment, impingement and thermal impacts of power plants using once-through cooling systems add to the losses of coastal resources already stressed by a multiplicity of factors including ocean warming, overfishing, and pollution.

The use of treated water to cool the new ESGS Units 5, 6, and 7 would eliminate entrainment and impingement losses at the existing Unit 1 and 2 intake. Once-through cooling will continue at Units 3 and 4. Therefore, marine organisms will continue to be lost to impingement and entrainment at the Unit 3 and 4 intake. However, when the ESPR Project comes on line, Units 5, 6, and 7 will become the base units and the volume of water circulated through Units 3 and 4 would be expected to drop compared to the existing condition. Thus, the use of reclaimed water to cool Units 5, 6, and 7 would significantly reduce impingement and entrainment at the ESGS intakes compared to the existing condition.

If tertiary treated water from the Hyperion WTP is used to cool Units 5, 6, and 7, and is discharged at the existing Unit 1 and 2 intake and/or outfall, water would be discharged to the ocean at a higher temperature than would occur under the proposed once-through cooling using seawater.

Discharge of water at a temperature of over 90°F would be expected to kill some planktonic organisms that become exposed to the hottest portion of the discharge plume. The number of planktonic organisms killed by exposure to the heated discharge from the outfall under this alternative would be expected to be much less than the number of planktonic organisms killed by entrainment in the once-through cooling system proposed by the Applicant for the ESPR Project. However, because reliable concentration estimates of plankton in the vicinity of the ESGS are not available, a quantitative comparison is not possible.

If secondary or tertiary treated water from the Hyperion WTP were used to cool Units 5, 6, and 7 and then discharged through the existing Hyperion outfall five miles offshore, minimal impacts to marine resources would be expected. The use of treated water would eliminate the impacts of impingement and entrainment from Units 5, 6, and 7. The discharge of water with a temperature rise of a little over 10°F above ambient at this location would not be expected to add significantly to the existing impacts of the Hyperion discharge.

Staff concludes that the use of secondary or tertiary treated water from the Hyperion WTP with subsequent discharge through the Hyperion outfall is the cooling alternative that would have the fewest adverse impacts to marine organisms. Staff recommends that these options be further evaluated for ESPR cooling.

CULTURAL RESOURCES

General Impacts of Using Reclaimed Water

The use of reclaimed water for cooling at ESGS would require a pipeline that would extend approximately one mile from the Hyperion WTP south to the El Segundo project site. Installation of the six-foot wide pipe would require a trench width of approximately nine to ten feet. As the pipeline leaves the Hyperion WTP, it would be bored under Vista del Mar and continue south to the El Segundo project site.

No previously recorded built environment resources were identified during the records search for the original El Segundo project. However, several archaeological sites in the vicinity of the originally proposed project were identified. A cultural resource survey was conducted only in the parking lot areas along the proposed pipeline route during the original studies for the El Segundo project. No additional built environment or archaeological resources were identified as a result of the survey of the parking lots adjacent to the proposed waterline route.

In order to determine whether there will be any impacts to archaeological resources, a cultural resources survey along the proposed pipeline would be necessary. In addition, due to the presence of nearby sites, staff would recommend presence/absence testing for cultural resources in the area where boring is anticipated. Staff would also recommend full time cultural resources monitoring along the entire pipeline route until the end of pipeline ground disturbance.

If an archaeological site or human remains of Native American origin were identified during a survey or presence absence testing, avoidance would be the first mitigation considered. If a site could not be avoided, an evaluation would be necessary to determine significance. If the site were recommended eligible to the California Register of Historic Resources or National Register of Historic Places, data recovery would be necessary.

If avoidance was not possible for a large site or discovery of human burials, the data recovery for the site or reburial of the human remains could be very expensive. An additional difficulty could arise if Native American groups did not want the human remains reburied. Some Native American groups object to moving human remains to another location for reburial.

Option 1: Tertiary Treatment, Discharge at ESGS

Use of Tertiary Treated Water would require that a tertiary treatment facility and a pumping system be constructed near the Hyperion WTP. The area of the records search covered the location of the Hyperion WTP. Archaeological sites are present in the vicinity. A cultural resources survey (historic and prehistoric) would need to be conducted in the area of earth disturbance. If cultural resources were identified, avoidance would be the first mitigation considered. If it was not possible to avoid the cultural resource, then a determination of significance would be made and if determined significant, data recovery would be necessary.

Use of Options 1A or 1B have the same potential to impact cultural resources from construction of the tertiary treatment facility, reclaimed water line and other earth disturbing activities.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

This option would require construction of a second pipeline to return cooling water to Hyperion. This would require that all the cultural resources surveys and mitigation described in “General Impacts of Using Reclaimed Water” be expanded to include this additional pipeline. All mitigation described for the original reclaimed water pipeline would also be applicable to this second pipeline.

Conclusion for Cultural Resources

Both the use of tertiary and secondary treated water would require pipeline construction. Because archaeological sites are present in the vicinity, cultural resource surveys would need to be conducted and cultural resource monitoring is recommended.

HAZARDOUS MATERIALS MANAGEMENT

General Impacts of Using Reclaimed Water

The municipal effluent from the Hyperion WTP would need to be processed and pre-treated before it can be used for a cooling medium in the ESPR project. Manufacturers of cooling equipment typically specify that the cooling medium to be used meet certain criteria in order to be acceptable for use with their equipment. This is necessary to alleviate the general water quality problems of scaling, corrosion, biological growth, and fouling. The pretreatment involves chemical conditioning and the type, level, frequency, and intensity of the pretreatment would depend on three factors, as a minimum. The quality of the Hyperion effluent would be one factor. The ability of the Hyperion plant to consistently maintain the quality of the effluent without violating regulatory discharge standards is another factor. The third would be the technical specifications for the cooling medium as required by the cooling equipment manufacturers.

Regulatory standards specified for the discharge of the cooling water after its once-through cooling use would also determine the need for additional end-of-the pipe treatment and the type and level of such treatment.

Consequently, use of some of the hazardous chemicals intended for seawater pretreatment cooling and end-of-pipe treatment prior to discharge may be minimized or eliminated, or increased for reclaimed water cooling purposes. There may be a need to use other additional chemicals. ESPR's design engineer would need to specify the type and amount of each chemical that would be required under the reclaimed water cooling scenario.

Option 1: Tertiary Treatment, Discharge at ESGS

Tertiary treated effluent is typically of good quality and the tertiary treatment normally renders the end product nearly equal in quality to fresh water. The tertiary treated effluent would however need additional chemical pretreatment prior to its use as a cooling medium and possibly before final discharge. Chemicals would then need to be stored and used at the proposed tertiary treatment facility depending on the tertiary treatment process used and /or cooling medium pretreatment needs.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

The discharge from the Hyperion WTP is currently treated to a secondary standard. A near-neutral pH, low suspended solids, low salinity levels and moderate organic content, would typically characterize this effluent. Because the quality of water intended for cooling purposes is important, the secondary effluent would need to be chemically pretreated prior to use as a cooling medium and possibly again prior to its proposed discharge from Hyperion.

Conclusion for Hazardous Materials Management

The use of reclaimed water cooling processes would require the storage and use of hazardous chemicals. The quality of the Hyperion effluent, cooling medium specification requirements, proposed tertiary treatment and applicable waste discharge standards would all influence the types of chemicals needed and their quantities for reclaimed water cooling.

Overall, the risks of hazardous chemical usage in reclaimed water-cooling can generally be expected to be no different from that in seawater cooling. It has been established that hazardous chemical usage in seawater cooling, as it stands right now, does not pose any significant impacts on public health. Any risks associated with chemical usage in reclaimed water cooling should be adequately mitigated through compliance with the appropriate federal, state, and local requirements for hazardous materials use and adherence to existing or modified conditions of certification or additional conditions of certification. The modified or additional conditions are contingent upon the type of chemicals used for reclaimed water-cooling.

LAND USE

Introduction

The evaluation of cooling technologies for ESGS for the land use technical area is primarily focused on two issues: (1) consistency with applicable land use plans, ordinances, and policies; and, (2) compatibility with existing and planned land uses.

Laws, Ordinances, Regulations, and Standards (LORS)

The Clean Water Act requires regulatory review and approval of any action that proposes to locate a structure, or excavate or discharge dredged or filled material into “Waters of the United States.” Under this Act, the quality of Waters of the United States must be protected from significant degradation and protected from unreasonable alteration or obstruction.

Applicable State laws for the implementation of an alternative cooling system would include the California Coastal Act of 1976 (Public Resources Code §30000 et seq.), the Warren-Alquist Act (Public Resources Code §25500 et seq.) and State Tide and Submerged Land Leasing (Public Resources Code §6701–6706).

Applicable local LORS for implementation of either cooling option would include the City of El Segundo General Plan, City of El Segundo Local Coastal Program (ESLCP) and the City of Los Angeles and City of El Segundo Zoning Ordinance.

California Coastal Act

The California Coastal Act (Coastal Act) establishes a comprehensive scheme to govern land use planning along the entire California coast. The Act also sets forth general policies which govern the California Coastal Commission's review of permit applications and local plans.

The City of El Segundo adopted its Local Coastal Program (LCP) on July 1, 1980 (City of El Segundo Resolution No. 3005). The Coastal Commission certified the program on February 4, 1982. The El Segundo LCP incorporated several policies of the California Coastal Act, specifically Chapter 3: Coastal Resources Planning and Management Policies (Section 30200 per seq.).

Included in these policies are those identified in Public Resources Code Section 30264, *Thermal electric generating plants,* which states:

> "Notwithstanding any other provision of this division, except subdivisions (b) and (c) of Section 30413, new or expanded thermal electric generating plants may be constructed in the coastal zone if the proposed coastal site has been determined by the State Energy Resources Conservation and Development Commission (a.k.a. Energy Commission) to have greater relative merit pursuant to the provision of Section 25516.1 than available alternative sites and related facilities for an Applicant's service area which have been determined to be acceptable pursuant to the provisions of Section 25516."

The sections referenced within this section allow examination of the project by the Coastal Commission. Section 30413 among other items requires the preparation of a consistency and suitability report by the Coastal Commission on the project for presentation to the Energy Commission on new power plants being placed in the Coastal Zone.

Section 25523(b) (which is part of the Warren-Alquist Act) requires the Energy Commission to include in its decision on an Application for Certification:

> "In the case of a site to be located in the coastal zone, specific provisions to meet the objectives of Division 20 (commencing with Section 30000) as may be specified in the report submitted by the California Coastal Commission pursuant to subdivision (d) of Section 30413, unless the commission specifically finds that the adoption of the provisions specified in the report would result in greater adverse effect on the environment or that the provisions proposed in the report would not be feasible."

Section 25526 (Warren-Alquist Act) states the following:

> "The commission (Energy Commission) shall not approve as a site for a facility any location designated by the California Coastal Commission pursuant to subdivision (b) of Section 30413, unless the California Coastal Commission first finds that such use is not inconsistent with the primary uses of such land and that there will be no substantial adverse environmental effects and unless the approval of any public agency having ownership or control of such land is obtained."

State Tide and Submerged Lands Leasing (Public Resources Code §6701-6706)

The California State Lands Commission (State Lands Commission) is responsible for the management and administration of all lands owned by the State, including the leasing of tide and submerged lands within the State's jurisdiction (Division 6, Part 2, §6701-6706 of the Public Resources Code).

Upon the enacting of the State Lands Act of 1938, the State Legislature vested in the State Lands Commission the authority to administer, sell, lease or dispose of the public lands owned by the State or under its control, including not only school lands but tidelands, submerged lands, swamp and overflowed lands and beds of navigable rivers and lakes. Also, the commission is authorized to provide for the extraction of minerals and oil and gas from state owned and controlled lands.

Any person who uses or occupies any lands owned or controlled by the State under the jurisdiction of the State Lands Commission is required to obtain a lease, permit, or other agreement and provide payment for rent.

The two intake structures on the El Segundo Generating Station property are on tidal and submerged land owned and administered by the State of California. The applicant has an executed lease with the State of California. The executed lease (No. 858.1 Public Resources Code Series, Ser. 18736A) is scheduled to expire on October 27, 2002. At the current time, the applicant has not filed an application with the State Lands Commission requesting a modification of the existing lease or creation of a new lease. Regardless of the stated expiration date in the lease, the actual termination of a lease with the State Lands Commission does not occur until such time as the Commission formally acts to terminate it. As long as the leaseholder (applicant) continues to operate in compliance with the original executed lease, the Commission would permit the operation/use to continue on a month-to-month basis until a new lease is executed with the Commission.

To ensure the long-term use of the intake structure for the project and the project's compliance with California State Lands Commission regulation - Article 9. *Lease Involving Granted Tide and Submerged Lands* and Public Resource Codes §6701–6706, staff plans to incorporate into its Final Staff Assessment a proposed condition of certification requiring the applicant to acquire a new lease prior to the start of commercial operation of the new facility. Assuming that the applicant is approved for a new lease by the State Lands Commission, the proposed project would be in compliance with requirements for the leasing of State owned tide and submerged lands.

Any structural modification or use of the facility's existing seawater intake structure for the ESGS would be subject to consistency with the State Lands Commission executed lease.

City of El Segundo Local Coastal Program

As noted above, El Segundo adopted its LCP in 1980, and the Coastal Commission certified the LCP in 1982. The ESGS site was designated within the LCP as Power Plant (PP), with uses that include "on-site repowering consistent with policy and regulatory requirements of other State and Federal agencies." This designation was based on analysis that showed the existing facility was consistent with Coastal Act policies because the "site is (a) a use of greater than local importance, (b) a suitable location for energy facility expansion (within the limits of space constraints), [and] (c) a coastal dependent use which has a high priority under the Coastal Act."

General Impacts of Using Reclaimed Water

The use of reclaimed water for cooling the new Units 5, 6, and 7 would eliminate the proposed use of seawater for cooling. Since the majority of generating units operating at the ESGS would be obtaining cooling water from a source other than the sea in order to function, the coastal dependent use definition may no longer apply to the facility. The overall facility and the specific project (installation of Units 5, 6, and 7) being proposed for the Energy Commission's permitting may be defined as a non-coastal dependent use.

The principal land use change and corresponding impact of this alternative would result from the construction of reclaimed water pipeline(s) between the ESGS and the Hyperion plant, to provide cooling water for the ESGS. The approach using tertiary treated water discharged at ESGS would require the construction of one pipeline. The approach using treated water discharged at Hyperion would require the construction of two pipelines, one for water delivery to the ESGS and a second for water return to the Hyperion plant. The proposed pipeline(s) will be located in both the City of El Segundo and the City of Los Angeles.

The pipeline connections to the ESGS and Hyperion plant would be directionally drilled under the Vista Del Mar roadway. The pipeline(s) would be buried in a trench on the seaward side (west) of and immediately adjacent to Vista Del Mar that fronts on Dockweiler State Beach. The trench would cut through the public parking lots along that stretch of beach. Construction activity would temporarily limit parking access to some beach areas.

No beach sand would be removed from the project area. The construction site would be restored to its original condition.

Based on communication with the staff of the California Coastal Commission, this beach area is considered to be reasonably stable. Shoreline erosion that could expose and endanger the pipeline(s) is not considered to be a significant threat. The proposed installation of the pipelines appear to be consistent with California Coastal Act policies (Luster, 2002).

In order to construct the required pipelines, only right-of-way encroachment permits will be required from the cities of El Segundo and Los Angeles (Garry, 2002).

Option 1: Tertiary Treatment, Discharge at ESGS

This approach would require construction of tertiary treatment facilities, a pump station, and one pipeline, resulting in additional construction impacts compared to the once-through cooling alternative with seawater. The trench required for the pipeline would be 9 to 10 feet wide. Pipeline construction should be staged to affect the smallest amount of beach and public parking area at any one time and scheduled to avoid the peak summer months to minimize conflict with recreational beach use.

The tertiary water treatment facility would be constructed at or near the Hyperion site. Because of the industrial character of the area, no land use related impacts, such as noise and visual, are expected as a result of the construction of tertiary water treatment facilities at or near the Hyperion plant. A tertiary water treatment facility would be compatible with the on-site and surrounding industrial land uses particularly the existing Hyperion facility. Potential visual and noise impacts are described in this alternative cooling analysis (Refer to the VISUAL and NOISE technical sections of this analysis).

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

This alternative would require two pipelines to be constructed in parallel between the ESGS and Hyperion facilities. One pipeline will be used to carry treated water from the Hyperion sewage treatment facility to the ESGS where it will be used for plant cooling purposes and then returned to the Hyperion facility through the second pipeline for eventual discharge. A common trench for both pipelines will be 16 to 18 feet wide. Construction, including directional drilling under Vista Del Mar, would take somewhat longer but should be able to be completed outside of the summer peak season.

Consistency with Plans, Ordinances, and Policies

The 33-acre ESGS property is shown to be within the designated coastal zone area. The land use designation for the project site shown in the City of El Segundo Local Coastal Program is “Power Plant”. The City of El Segundo’s General Plan designates the site as “Heavy Industrial.” The Heavy Industrial designation allows generating stations. The property is zoned “Heavy Industrial” (M-2) by the City. Under the City’s Title 15: Zoning Regulations, Chapter 6, the M-2 Zone allows generating stations as a permitted use.

The key land use issue for the alternative cooling options is whether the project would be consistent with the City’s Local Coastal Plan if the project were modified to use reclaimed water in its cooling system. In accordance with the City of El Segundo Local Coastal Program and the City of El Segundo’s Council Resolution No. 3005, the primary industrial land uses in the coastal zone are coastal dependent uses as defined by the Coastal Act. The LCP found the existing power plant to be consistent with the Coastal Act in part because it was a coastal dependent use. Coastal Act Section 30101 defines a coastal dependent development or use as “…any development or use which requires a site on, or adjacent to, the sea to be able to function at all.” If the project were modified to eliminate the use of seawater, it might no longer be considered a coastal dependent use.

Under the LCP, new industrial development in the coastal zone is limited to modifications of existing facilities. The California Coastal Act includes several provisions that relate to coastal dependent development and particularly to the location or expansion of power plants in the coastal zone. CCA §30260 encourages the expansion and reasonable long-term growth of coastal dependent industry at existing sites.

The alternative cooling systems being considered in this report are evaluated as possible mitigation for the adverse impacts to coastal resources caused by the proposed once-through cooling system. Use of an alternative cooling system would reduce or eliminate the significant use of seawater and may allow the project to be consistent with the Coastal Act's requirements for the protection of coastal resources.

Staff recognizes that the Coastal Commission has the responsibility for interpreting these provisions in its report to the Energy Commission under CCA §30413(d). If the Coastal Commission determines that the project using an alternative cooling system in place of seawater cooling is not coastal dependent industry it would be inconsistent with the site's land use designation under the El Segundo LCP. This inconsistency would be a significant land use effect unless the City amended its LCP.

Modification of the facility's existing seawater intake structure would be subject to consistency with the California Coastal Act and the State Lands Commission executed lease. Both intake structures on the project site are on designated state tidal and submerged lands owned and administered by the State of California. The State Lands Commission is the administrating agency for State owned lands. The Applicant has an executed lease with the State of California. The executed lease (No. 858.1 Public Resources Code Series, Ser. 18736A) is scheduled to expire in October 27, 2002.

Conclusion for Land Use

The proposed use of a reclaimed water cooling system for the project may affect whether the project is consistent with the "coastal dependent" (as defined by the California Coastal Act) designation and the City's "Power Plant" designation on the 33 acre project site. Adoption of this type of cooling system could be viewed as an elimination of the "coastal dependent use" features of the ESGS facility and this project. Although the project could be considered inconsistent with the Coastal Act and the City of El Segundo's LCP, staff believes that adoption of the use of reclaimed water in place of seawater as mitigation for adverse effects to coastal resources should not prevent approval of an otherwise allowable expansion of an existing coastal dependent power plant.

The Coastal Commission will have the responsibility for interpreting relevant provisions of the Coastal Act and the El Segundo Local Coastal Program in its report to the Energy Commission required under Section 30413(d) of the Coastal Act. If the Coastal Commission determines that the project using a closed cooling system with reclaimed water in place of once-through cooling system using seawater is not coastal dependent, it would be inconsistent with the site's land use designation under the ESLCP.
A significant land use impact would occur if the City elected not to amend its LCP. The Applicant could file an amendment request to the City's LCP with the Coastal Commission for their consideration.

The actual installation of an underground pipeline that would transport reclaimed water from the Hyperion sewage disposal facility to the ESGS for cooling purposes would not result in significant adverse land use impacts provided construction can be staged to affect the least possible amount of land at any one time and scheduled to avoid peak beach use by the public.

NOISE

It appears that the once-through cooling system using wastewater would involve no significant noise sources that were not addressed in the Staff Assessment, except that additional construction would be required for the pipelines. That is, any pumps, and most construction measures, required for its operation would probably be the same as, or similar to, those required at the power plant site for seawater cooling. If tertiary treated water was used and a new tertiary treatment facility constructed at Hyperion WTP, similar construction noise would also occur at that location.

These noise sources were included in the Staff Assessment noise level predictions, and any necessary mitigation measures were addressed by the original acoustical design of the project. To ensure compliance with the proposed noise-related Conditions of Certification, the operator would have to ensure that any required changes in pump types, sizes and locations, and their resulting noise emissions, are accounted for in the plant design and noise mitigation measures. At this time, it does not appear that any such changes would result in significant noise impacts.

PUBLIC HEALTH

General Impacts of Using Reclaimed Water

Any public health impacts from cooling-related use of reclaimed water would result from public exposure to any toxic constituents posing cancer and non-cancer risks. The potential for such impacts would depend on the concentrations of such toxicants in the treated water. The purpose of secondary or tertiary treatment is to reduce the levels of such constituents to levels appropriate to the proposed use of the water.

Option 1: Tertiary Treatment, Discharge at ESGS

Tertiary wastewater treatment can purify the water to a degree where its toxic constituents would be below applicable drinking water standards, thereby minimizing the potential for exposure-related health impacts. If such water were to be utilized for ESPR's cooling needs, the necessary tertiary treatment facility would best be located at the site of the existing Hyperion WTP. Since such water would be utilized in an enclosed system for once-through cooling, there would be minimal risk of human exposure to the toxicants at issue. Any chemical additives against system corrosion and bio fouling would be utilized at levels not posing a health hazard to humans at either the outfall discharge area or any point within or around the project itself. Impacts would be similar for Options 1A and 1B, and are expected to be less than significant.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

Although secondary treatment yields water of a lesser quality than tertiary treatment, general standards for the toxic constituents of such water (as currently produced at the existing Hyperion WTP) have been established and they are low enough for safe use in the enclosed, once-through cooling system proposed for continued utilization at ESPR. As with water from tertiary treatment, any chemical additives against system corrosion and bio fouling would be at levels established as not posing a health hazard to potentially exposed humans.

Conclusion for Public Health

Once-through cooling using reclaimed water would create minimal human exposure to any potentially toxic constituents of the utilized water because the once-through system is a closed system. This means that there would be minimal exposure-related health risks (and therefore no public health differences) from continued use of either seawater or reclaimed water from secondary or tertiary treatment facilities. Impacts would be similar with use of either tertiary or secondary treated water and at any of the discharge options.

SOCIOECONOMIC RESOURCES

General Impacts of Using Reclaimed Water

Cooling with reclaimed water would not have significant impacts on employment or housing demand in El Segundo or surrounding communities, and thus would not impact schools. As with other power plant designs, direct fiscal impacts on the community should be positive because of higher property values for a new plant than for the existing plant. Use of reclaimed water for cooling would require an agreement with the WBMWD or City of Los Angeles to acquire and possibly treat water from the Hyperion WTP. Payment to the City or WBMWD for use of the water would provide fiscal benefits to the public agencies and ratepayers who pay for water treatment. Construction of pipelines would cause temporary disruption to vehicles on Vista del Mar and beach users along the proposed pipeline right-of-way, but if proper measures are taken to minimize the disruption, this should be a less than significant community impact.

Option 1: Tertiary Treatment, Discharge at ESGS

This alternative would require construction of tertiary treatment facilities, a pumping station, and pipeline, generating additional construction activity compared to once-through cooling. The construction jobs would provide a small incremental employment benefit. Pipeline construction should be staged to minimize conflict with recreational use of the beaches that peaks during the summer months, and generates economic activity in nearby communities.

The discharge options under consideration would not result in different socioeconomic impacts.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

This alternative would require a second parallel pipeline between the ESPR and Hyperion facilities. Socioeconomic impacts would remain positive but relatively insignificant. Construction of the pipelines should be staged to minimize conflicts with peak season beach utilization, which provides economic benefits to nearby communities.

Conclusion for Socioeconomic Resources

Any of the cooling options should have positive short-term employment impacts, and probably will generate positive fiscal benefits to the water provider. Construction and operation of the ESPR with or without use of reclaimed water for cooling should not have any significant adverse socioeconomic impacts.

With standard construction mitigation practices, potential adverse impacts on beach visitor days associated with pipeline construction can be kept to less than significant levels.

TRAFFIC AND TRANSPORTATION

General Impacts of Using Reclaimed Water

Traffic and transportation impacts associated with the use of different cooling methods for the project are minimal and would be associated primarily with pipeline construction.

Option 1: Tertiary Treatment, Discharge at ESGS

The new units would use tertiary treated water for cooling. In this scenario, a tertiary treatment facility and a pumping system would need to be constructed at or near the Hyperion WTP as part of the ESPR project. From this new facility, the tertiary treated reclaimed water would be pumped to a pipeline, which would traverse approximately one mile south to the power plant.

It is assumed that the pipeline would be bored under Vista del Mar, and then the pipeline would parallel the road, on its west side, continuing to the power plant's northern border. The pipe would be approximately six feet in diameter, either concrete or plastic. The trench for construction would have to be wider than six feet — probably about 9 or 10 feet wide. Inside the plant boundary the pipe would deliver treated water to the existing intake structure.

The transportation impacts associated with this option would be focused on the pipeline construction activity on Vista Del Mar and across the driveways to the parking lots located on Dockweiler State Beach. If construction activity or maintenance activity were required within any public road right-of-way, then applicable LORS would be enforced and the Conditions of Certification of the Staff Assessment for the project would include the development of a Transportation Management Plan containing a Traffic Control Plan to mitigate any impacts associated with construction activities in the public roadway to a level of insignificance. Traffic and transportation impacts would be the same with discharge Options 1A and 1B.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

Hyperion currently discharges secondary treated water through its seven-mile discharge pipe to the ocean. ESPR could use this secondary treated water or tertiary treated water for cooling, and then return the warmed water to Hyperion for disposal through its existing discharge pipe. This option would require construction of a second pipeline from Hyperion to ESPR (one pipeline would transport water in each direction), but it would eliminate discharge using the existing ESGS discharge pipes.

The transportation impacts associated with this option remain focused on construction activity of both pipelines (to and from ESPR from Hyperion) located adjacent to each other under Vista Del Mar and across the driveways to the parking lots located on Dockweiler State Beach. If construction activity or maintenance activity were required within any public road right-of-way, then applicable LORS would be enforced and the Conditions of Certification of the Staff Assessment for the project would include the development of a Transportation Management Plan containing a Traffic Control Plan to mitigate any impacts associated with construction activities in the public roadway to a level of insignificance.

Conclusion for Traffic and Transportation

The use of reclaimed water, either tertiary or secondary, would involve the construction of one or two pipelines to the Hyperion WTP. Traffic and transportation impacts are expected to be minimal since the Applicant would comply with applicable LORS and the provisions of a Transportation Management Plan/Traffic Control Plan.

VISUAL RESOURCES

General Impacts of Using Reclaimed Water

The principal visual effect of using reclaimed water would result from temporary impacts of construction of a required pipeline to transport reclaimed water from the Hyperion WTP approximately one mile north of the proposed ESPR. In addition, a tertiary water treatment plant could be constructed as described below.

Option 1: Tertiary Treatment, Discharge at ESGS

Although the exact routing of the pipeline is not known with certainty, it is assumed that it would parallel Vista del Mar at the roadway’s west shoulder. Though trenching and construction in the roadway shoulder could have adverse impacts, these would be temporary and of relatively short duration. Consequently, this impact is regarded as less than significant.

Under this option, a tertiary treatment facility and pumping system would be constructed at or near the Hyperion site as part of the ESGS project. This facility is anticipated to occupy a minimum of 5 acres of land, and consist of structures no taller than a single story.

The Hyperion site and vicinity, like the ESGS site itself, occupy visually exposed portions of the coastal zone seen by very high numbers of motorists traveling on Vista del Mar (Pacific Coast Highway). Existing structures at the Hyperion facility that are visible to the public are generally architecturally designed to conceal mechanical equipment and resemble typical commercial structures, thus reducing their industrial character and enhancing the appearance of the facility. If this option were proposed, and the tertiary treatment facility were to be visible to motorists on Vista del Mar, similar design treatment could be required to avoid adverse impacts and assure LORS conformance.

With appropriate architectural design, a visually exposed tertiary treatment facility would likely blend with the character of the existing Hyperion facility and environs, representing a less than significant impact under CEQA and conforming with applicable LORS.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

The principal difference between Options 1 and 2 from a visual standpoint is that, under Option 2, a second pipeline would be required. The pipeline is assumed to be adjacent to the first, so additional impacts beyond those described for Option 1 would be negligible. With the following mitigation measures, impacts of this option would be short-term and less than significant.

Mitigation Measures

Overall period of construction for both pipelines under Options 1 and 2 shall be limited to less than one year. Any removed landscaping shall be limited to the minimum extent feasible, and replaced on a one-to-one basis. With these measures, impacts would be short-term and less than significant.

If the Applicant were to amend its proposal to include the use of reclaimed water for cooling, the Applicant would be required to submit a detailed proposal necessitating additional staff review. Staff would analyze this proposal at that time, including specific siting and design of the treated water facility. Because the specific project characteristics are not known, no Conditions of Certification are presented at this time.

It is assumed that staff would recommend specific Conditions of Certification embodying any needed mitigation during review of an amended application, in order to address potential visual impacts and LORS conformance issues related to these new structures as a result of the amended proposal.

Conclusion for Visual Resources

With recommended mitigation measures as described above, the use of reclaimed water for cooling at the ESPR would not create any significant visual effects.

WASTE MANAGEMENT

General Impacts of Using Reclaimed Water

Project excavation may encounter potentially contaminated soils and/or groundwater. However, excavation would not be necessary in tidal or offshore areas for any of the alternatives, so effects to these areas will be the same as the preferred project. Refer to the **Waste Management** section of the SA for discussions on contaminated soils and groundwater that specify appropriate mitigation measures and Conditions of Certification to ensure less than significant impacts.

Option 1: Tertiary Treatment, Discharge at ESGS

This option would entail the construction of a tertiary treatment plant and a pipeline from the Hyperion WTP to the ESPR. The tertiary treatment plant, which would be constructed at or near the Hyperion site, would encompass up to five acres. The water supply line, which would extend from Hyperion to the ESPR intake structure approximately one mile away, would temporarily disturb approximately two acres within the Vista Del Mar right of way.

Excavation activities may encounter contaminated soils and/or groundwater. Therefore, proper handling and disposal procedures may be necessary. A Phase I Environmental Site Assessment will be needed for the site and the pipeline route prior to site preparation. Follow-up testing as part of a Phase II Environmental Site Assessment may also be needed. Once proper environmental site assessments have been conducted, the potential impacts will be clearer. Please also refer to the **Waste Management** section of the FSA for discussions on contaminated soils and groundwater that specify appropriate mitigation measures and Conditions of Certification to ensure impacts are less than significant.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

This option would require the construction of one pipeline to the ESPR site and a second pipeline back to Hyperion. The overall trenching and right of way for soil stockpiles would disturb approximately four acres.

As with the first option, excavation activities may encounter potentially contaminated soils and/or groundwater. Therefore, proper handling and disposal procedures may be necessary. A Phase I Environmental Site Assessment will be needed for the pipeline route prior to excavation. Follow-up testing as part of a Phase II Environmental Site Assessment may also be needed. Refer to the **Waste Management** section of the FSA for discussions on contaminated soils and groundwater that specify appropriate mitigation measures and Conditions of Certification to ensure impacts are less than significant.

Conclusion for Waste Management

The reclaimed water use options would consist of onsite and offsite earthmoving activities and would temporarily disturb approximately four to five acres. However, Phase I and perhaps Phase II Environmental Site Assessments will be necessary to ensure that hazardous wastes are remediated prior to site preparation. With these steps taken, impacts can be mitigated to less than significant levels.

WATER AND SOIL RESOURCES

General Impacts of Using Reclaimed Water

Earthmoving for construction of a wastewater pipeline from Hyperion and other appurtenant structures could potentially induce erosion and sedimentation, which may impact water quality via an increase in sediment load within nearby receiving waters. Project excavation may encounter potentially contaminated soils and/or groundwater. Refer to the **Waste Management** Section of the **FSA** for further discussion regarding contaminated soils and/or groundwater.

Thermal impacts related to the heat contained in the cooling water discharge from these options will result in an increase in temperature of the water discharged to the ocean with the potential for adverse impacts to biota. In addition, a new or revised NPDES permit would be required for the changed discharge temperature and constituents. Impacts on the biological communities are discussed in the **Aquatic Biology** section of this analysis.

The earthmoving activities required for use of reclaimed water would need to be addressed as part of the overall ESPR NPDES permit for stormwater discharge from construction activities. The permit would require that the applicant develop a Stormwater Pollution Prevention Plan (SWPPP) that identifies Best Management Practices (BMPs) employed to preserve stormwater quality.

As with any other waste discharge, compliance with the thermal limits contained in the NPDES permit would be necessary. If thermal limits are exceeded by these options, either a waiver to the thermal limits or a modified design and operational plan may be necessary. If process waste streams or other waste steams are discharged with the treated cooling water, which has less volume relative to the currently proposed project, constituent concentrations in the cooling water discharge may increase, and would be subject to NPDES effluent limits.

Option 1: Tertiary Treatment, Discharge at ESGS

Earthmoving Issues. The use of tertiary treated water for cooling would entail the construction of a tertiary treatment plant and a pipeline consisting of a six-foot-diameter, approximately one-mile-long line from Hyperion (source of reclaimed water) to the ESPR intake structure. Temporary earthmoving would also be necessary to connect the discharge pipeline to the existing outfall (Option 1A). Depending on the approach for the type of treatment systems selected for the tertiary treatment activity, earth disturbance activities for such an activity could range up to 5 acres.

The water supply line would extend approximately one-mile from Hyperion to the ESPR intake structure, and would temporarily disturb approximately two acres within the Vista Del Mar right of way. Excavation activities may encounter potentially contaminated soils and/or groundwater, and proper handling and disposal procedures will be necessary. Refer to the **Waste Management** section of the **FSA** for further discussion on contaminated soils and groundwater that specify appropriate mitigation measures and Conditions of Certification to ensure impacts are less than significant.

Because a SWPPP needs to be developed and the project would have to comply with all requirements of the Clean Water Act, impacts related to erosion and sediment control and stormwater runoff would be less than significant. Examples of BMPs would be the use of sediment barriers, limiting the amount of exposed area, conveyance channels, sediment traps, and stormwater quality control devices. Excavation would not occur in tidal or offshore areas for either of the options.

Thermal Impacts. Staff performed simplified thermal plume analyses for Options 1A and 1B. The El Segundo AFC specified a cooling water flowrate of 207 mgd with a discharge temperature rise of 19.3^{o}F for the new units (Nos. 5, 6, and 7). The reclaimed water options would involve a smaller flowrate (70 to 150 mgd) with discharge either through the Units 1 and 2 outfall (Option 1A), through the Units 1 and 2 outfall and intake (Option 1B). The thermal plumes resulting from these modified discharges are relatively complex, in particular because they involve interaction with the Units 3 and 4 plume.

Option 1A

In this option, the tertiary treated cooling water would be discharged to the ocean using the existing discharge pipe. Although the heat discharge rate and the discharge structure would be the same as proposed by the Applicant, other key aspects of the discharge would differ significantly. The reduced flowrate would cause a proportional increase of discharge temperature rise (discounting any reduction of efficiency caused by the higher cooling water temperatures), and a decrease in discharge velocity. In addition, the discharge would be fresh water instead of seawater, with considerably more buoyancy (lower density relative to seawater). The result would be a thinner plume with higher temperatures. Because of the interaction with the Units 3 and 4 discharge, plume characterization would require computer modeling beyond the scope of this evaluation. Preliminary evaluation using a nearfield model (Wright et al., 1991), and extrapolation of the far field model conducted for the SA provide the approximate results summarized in **EL SEGUNDO COOLING OPTIONS Table 3**.

EL SEGUNDO COOLING OPTIONS Table 3
Results of Thermal Discharge Analysis for Option 1

	Discharge Flowrate (mgd)	Discharge Temperature Rise (°F)	Maximum Surface Temperature Rise (°F)	Average Temperature Rise at Edge of Mixing Zone[1] (°F)	4°F Surface Temperature Rise Isotherm	
					Length[2] (ft)	Area[2] (Acres)
Proposed project	207	19.3	19	10	7,000	800
Option 1A with 14-ft. outfall	150[3]	26.6	26.6	11	7,300	860
	70	57.2	57	17	7,700	1,000
Option 1A with 7-ft. outfall	150[3]	26.6	26.6	7	4,600	350
	70	57.2	57	13	7,500	900

(1) Approximately 100 ft from discharge
(2) Approximate
(3) Data generated for the 150 mgd case are approximate.

Option 1B

Discharging through both intake and discharge structures would not provide significantly more dilution, because the discharge velocity would be further reduced. This option is therefore not evaluated in detail in this section, so the results illustrated in Table 3 would also apply. However, retrofitting the Units 1 and 2 discharge structure to increase the discharge velocity would increase dilution. For preliminary evaluation, reducing the discharge diameter from 14 feet to 7 feet was considered, and results for this case are provided in **EL SEGUNDO COOLING OPTIONS Table 3**.

In all cases, because of the relatively small discharge depth below the water surface, the maximum surface temperature rise will be essentially equal to the discharge temperature rise.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

Earthmoving Issues. This option would entail the construction of a pipeline to the ESPR site and a second pipeline back to Hyperion. Each pipeline would be six feet in diameter and approximately one mile long. The overall trenching and right of way for soil stockpiles would disturb approximately four acres. Because a SWPPP would be required and the project would need to comply with the Clean Water Act, impacts related to erosion and sediment control and stormwater runoff would be less than significant.

Excavation activities may encounter potentially contaminated soils and/or groundwater; therefore, proper handling and disposal procedures may be necessary. Refer to the **Waste Management** section of the Staff Assessment for discussions on contaminated soils and groundwater that specify appropriate mitigation measures and Conditions of Certification to ensure impacts are less than significant.

Thermal Issues. In this option, the cooling water would be returned to the Hyperion WTP and discharged with the Hyperion effluent. When the thermal discharge of the ESPR (150 mgd) is added to the remainder of the Hyperion discharge volume (for a total of 450 mgd), the resulting temperature rise is expected to be 7^{o}F,[3] which is considerably lower than the discharge temperature of Option 1. The effect of this temperature rise will be to increase the buoyancy of the Hyperion effluent, and cause the plume to rise higher in the water column than it would without the heated water. However, temperature has a smaller effect on buoyancy than salinity, and this impact may be small.

Conclusion for Soil and Water

Compliance with LORS

A detailed analysis of LORS compliance is beyond the scope of this assessment. However, there will be waste discharge and other permit requirements for the new tertiary treatment facility that may be constructed, with which the redesigned project will have to comply. Dilution ratios and blowdown water quality effects for some constituents are expected to remain approximately the same as the proposed project, and will be regulated by a new or revised NPDES permit (either for the ESPR or for Hyperion, depending on the discharge option). If process waste streams or other waste steams are discharged with the secondary treated cooling water, which has less volume relative to the currently proposed project, constituent concentrations in the cooling water discharge may increase, and would be subject to NPDES effluent limits. The discharge would also need to be kept in compliance with the thermal limits contained in any new or revised NPDES permit for ESPR or for Hyperion, depending on the discharge option.

Earthmoving Impacts

Because existing intake structures and outfall structure would be used for the ESPR project, the options considered herein would not require any earthmoving and/or dredging and filling within the Santa Monica Bay. However, minor maintenance dredging activities would periodically be required around the intake structure, as for the proposed project using seawater for cooling. Such activities may require a permit from

[3] The temperature rise can be calculated to this level of accuracy because it depends on the thermal loading (Btu/hr) and is independent of the flow from Hyperion to the plant and back.

the Army Corps of Engineers. Sedimentation impacts would be less than significant with BMPs such as silt curtains and limiting the amount of dredging.

The reclaimed water use options would consist of onsite and offsite earthmoving activities and could temporarily disturb up to five acres. However, because the earthmoving activities would be temporary, BMPs would be employed to minimize erosion and sedimentation, and with all affected areas returned to stable conditions impacts would be less than significant.

Thermal Impacts

In all cases, because of the relatively small discharge depth below the water surface, the maximum surface temperature rise would be essentially equal to the discharge temperature rise.

Average outfall temperatures at the edge of the mixing zone for both Options 1A and 1B would be increased by about 3 to 7^{o}F and have a maximum surface temperature rise of between 17 to 38^{o}F. For Option 2, the increased temperature of the Hyperion effluent would increase its buoyancy and cause the plume to rise higher in the water column than normally. However, temperature has a smaller effect on buoyancy than salinity and therefore this impact may be small. As with any other waste discharge, compliance with the thermal limits contained in the NPDES permit would be necessary.

WORKER SAFETY AND FIRE PROTECTION

General Impacts of Using Reclaimed Water

Project excavation may encounter potentially contaminated soils and/or groundwater. However, excavation will not be necessary in tidal or offshore areas for any of the alternatives, so effects to these areas will be the same as the preferred project. Refer to the **Waste Management** and **Worker Safety/Fire Protection** sections of the SA for discussions on contaminated soils and groundwater that specify appropriate mitigation measures and Conditions of Certification to ensure less than significant impacts.

Option 1: Tertiary Treatment, Discharge at ESGS

Excavation activities may encounter contaminated soils and/or groundwater. Therefore, proper handling procedures may be necessary. A Phase I Environmental Site Assessment will be needed for the site and the pipeline route prior to site preparation and a Phase II Environmental Site Assessment may also be needed. Once proper environmental site assessments have been conducted, the potential impacts to workers will be clearer. Standard worker safety regulations, including those for trenching, confined spaces, and exposure to hazardous wastes must be followed. Please also refer to the **Waste Management** and **Worker Safety/Fire Protection** sections of the SA for discussions on contaminated soils and worker safety standards that specify appropriate mitigation measures and Conditions of Certification to ensure impacts on workers are less than significant.

Fire protection impacts are expected to be the same as those identified for the construction and operations of the proposed ESPR as described in the SA and can be addressed by adherence to the LORS and proposed Conditions of Certification found in that document.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

As with the first option, excavation activities may encounter potentially contaminated soils and/or groundwater. Therefore, proper handling and disposal procedures may be necessary. A Phase I Environmental Site Assessment will be needed for the pipeline route prior to excavation. Follow-up testing as part of a Phase II Environmental Site Assessment may also be needed. Please also refer to the **Waste Management** and **Worker Safety/Fire Protection** sections of the SA for discussions on contaminated soils and worker safety standards that specify appropriate mitigation measures and Conditions of Certification to ensure impacts on workers are less than significant.

Conclusion for Worker Safety and Fire Protection

The reclaimed water use options would consist of onsite and offsite earthmoving activities and would temporarily disturb approximately four to five acres. Worker safety regulations, including those addressing trenching, confined spaces, and hazardous wastes must be followed. Additionally, Phase I and perhaps Phase II Environmental Site Assessments will be necessary to ensure that potential hazardous wastes are remediated prior to site preparation. Thus, impacts on workers can be mitigated to less than significant.

Fire protection impacts are expected to be no different from those identified for the construction and operations of the proposed ESPR as described in the SA and can be mitigated by following all LORS and the proposed Conditions of Certification.

POWER PLANT EFFICIENCY

General Impacts of Using Reclaimed Water

In a combined cycle power plant such as the ESPR, roughly two-thirds of the electrical energy produced is generated by the gas turbine generators; the remaining one-third is generated by the steam turbine generator. The thermodynamic cycle that operates the steam turbine includes a condenser, in which spent steam that has driven the steam turbine is condensed into water. This condensing action is accomplished by transferring heat from the steam to cooling water, which then carries the heat away. As the steam condenses into water, a vacuum is created in the condenser behind the steam turbine. The more effectively heat is removed, the stronger this vacuum is, and the more power the steam turbine produces.

The efficiency of the steam cycle, and thus of the entire power plant, can be affected by the ability of the cooling water to carry away this heat of condensation. In the existing power plant, and in the ESPR project as proposed in the AFC, ocean water is pumped through the condenser, picks up heat, and is then returned to the ocean. If an alternative cooling system were employed that removes heat less effectively than the proposed ocean water system, then the condenser vacuum would not be as great, and the steam turbine would produce less power while consuming the same amount of energy. This would result in a reduction in efficiency.

The proposed project would circulate 148,000 gpm of ocean water through the condenser; this water would be taken in at a relatively constant temperature of 60°F. After absorbing the spent steam's heat of condensation, it would be returned to the ocean at a temperature of 78°F. This cooling flow would yield a condenser backpressure of approximately 1.14 inches of mercury (in. Hg). This represents very effective cooling, producing optimum backpressure. (Atmospheric pressure, representing no vacuum at all, is nominally 29.92 in. Hg.)

Option 1: Tertiary Treatment, Discharge at ESGS

Tertiary treated water from the Hyperion WTP would be supplied to the condenser at a flowrate between 49,000 and 140,000 gpm, in a temperature range of 72 to 88°F. Assuming the higher flowrate of 140,000 gpm, the water would depart the condenser in the range of 105 to 125°F, producing a condenser backpressure ranging from approximately 2.59 to 4 in. Hg. This could be expected to produce a reduction in power plant efficiency of less than 0.5 to 4 percent. Assuming the lowest flowrate of 49,000 gpm, the water would depart the condenser at 145°F, producing a condenser backpressure of about 4 to 6.7 in. Hg, for a reduction in power plant efficiency approaching 4 to 6 percent.

This rough estimate of efficiency loss would not be substantially affected by the choice of discharge option.

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

The above estimate of power plant efficiency loss would remain the same if the cooling water were discharged at Hyperion.

Conclusion for Power Plant Efficiency

Employing reclaimed water for condenser cooling, whether tertiary treated or secondary treated, would result in a drop in power plant efficiency on the order of 0.5 to 6.7 percent. While Energy Commission staff believes that a 2.5 percent drop in efficiency may be acceptable in order to achieve a reduction in impacts on aquatic biota, staff questions accepting a drop in efficiency as great as 6.7 percent. If cooling water supplies could be maintained at least at the 76,000 gpm rate, holding efficiency loss to approximately 2.5 percent, staff deems this acceptable. Should cooling water flowrates drop significantly below this figure, staff deems this an unacceptable degradation in efficiency, representing a waste of energy resources. Staff recommends that only the higher flow rates be considered with 140,000 gpm the preferred flow.

POWER PLANT RELIABILITY

General Impacts of Using Reclaimed Water

A reliable supply of condenser cooling water is essential for operation of the ESPR. If the flow of cooling water is interrupted, the entire plant must be shut down, causing the loss of 630 MW of generating capacity.

Option 1: Tertiary Treatment, Discharge at ESGS

Tertiary treated water from the Hyperion WTP would be supplied to the plant's condenser for use in condensing spent steam in the steam turbine cycle. The Hyperion plant has exhibited remarkable reliability; Energy Commission staff could find no evidence of untreated sewage being discharged into Santa Monica Bay as a result of plant failure for many years.

The system to deliver tertiary treated water to the ESPR, consisting of piping, pumps, and valves, can be expected to be extremely reliable. These components are typically very reliable, and redundant equipment could be installed where advisable.

The reliability of this system would likely be substantially the same with either discharge option (1A or 1B).

Option 2: Secondary or Tertiary Treatment, Discharge at Hyperion

While this option would entail constructing and operating additional water piping compared to Option 1, overall reliability of the system can be expected to be effectively identical to that described above.

Conclusion for Power Plant Reliability

Employing reclaimed water from the Hyperion WTP for condenser cooling, whether tertiary treated or secondary treated would likely not compromise power plant reliability compared to continued use of ocean water-cooling.

5 ENVIRONMENTAL ANALYSIS OF HYBRID COOLING

Hybrid cooling, using cooling towers in the configuration illustrated in **COOLING OPTIONS Figure 2**, is evaluated here in the disciplines in which impacts could be most severe: land use, visual resources, noise, and air quality. Impacts of hybrid cooling are not analyzed for other disciplines.

Land Use Impacts of Hybrid Cooling

The physical impacts of hybrid cooling using reclaimed water in comparison to the once-through cooling system would primarily include: (1) increased operational noise; (2) installation of additional linears; (3) increased facility bulk and visual impact; and, (4) modification and/or abandonment of the existing seawater intake structure.

From the land use perspective, the hybrid cooling alternative using reclaimed water may not be consistent with the California Coastal Act consistency determination as previously discussed; see discussion under California Coastal Act in Section 4.

The City of El Segundo M-2 Zone District has a maximum height requirement of 200 feet. The height of a potential cooling tower for the project would be 70 feet, so the height of the tower would not present an inconsistency with the zone district regulation.

Visual impacts on surrounding land uses for the hybrid cooling alternative are considered to be greater than use of a once-through cooling system due to the potential presence of a vapor plume. However, plume abatement is assumed to be part of the tower design. Please refer to the **Visual Resources** section of this report for discussion of impacts and mitigation.

Noise impacts to surrounding land uses and sensitive receptors may be potentially significant. Please refer to the **Noise** section of this report for additional information regarding impacts and mitigation.

The hybrid-cooling alternative also includes construction of a pipeline for cooling water that would connect the ESGS facility to the Hyperion water treatment facility. This pipeline would be constructed within city streets. Construction of the pipeline would temporarily generate public and surrounding land use nuisances; such as increased noise, impede traffic flow and reduce beach access during construction. However, due to the temporary nature of the construction activity, these impacts are not considered to generate a significant effect to land use.

NOISE IMPACTS OF HYBRID COOLING

Introduction

The use of a hybrid cooling system consisting of cooling towers with plume abatement would introduce additional noise sources to the overall plant design, consisting of fans, motors, pumps and gearboxes. The most significant noise sources are the fans, which are located relatively high on the system structures. Motors, pumps, and gearboxes for wet cooling towers are typically located near ground level. These noise sources may be shielded from view by other components of the system, including the fan shrouds.

The array of cooling tower structures may provide shielding of some units at sensitive receptors, depending on the receptor position. That is, one of the radiator units may block line of sight to some or all of the others, which would reduce the noise received from the shielded units. For receptors parallel to the array, each unit would contribute noise to the total noise exposure, with little or no shielding. In this case, it was assumed that the worst-case sensitive receptor location would have a view of a portion of both cooling tower arrays.

Any type of combined cycle power plant will introduce the possibility of high startup noise levels due to the need to bypass HRSG-produced high-pressure steam to the condenser until it is of adequate quantity and quality to send to the steam turbine. Silencers or other acoustical treatment may be required in the steam lines to ensure that noise due to the steam bypass during startup does not exceed acceptable levels.

Generalized noise level data used for this analysis were obtained from a typical installation described by a supplier of cooling equipment for power plants and similar industrial installations. The actual noise emissions of a given cooling system installation may vary from these values, depending on final system configuration, but the values presented here are expected to be reasonably representative of typical installations.

Noise Analysis

Ten cooling towers in two rows of five are proposed as the base case. Staff developed working assumptions for this alternative, conceptually based upon data provided by GEA, a provider of dry and wet cooling equipment. The reference noise level for a typical array of standard cooling tower units is assumed to be 64 dBA at a distance of 400 feet, based upon data provided by GEA for the Morro Bay Power Plant project. This value has not been affirmed by the applicant, so the system configuration which could feasibly be installed on the project site could produce more, or less, noise than presumed here.

The presumed location of the nearest sensitive receptor (a home on 45th Street or the Strand) is about 600 feet from the nearest array, and about 750 feet from the second array. Based upon spherical spreading, and accounting for the two noise sources, the predicted fan noise level at the nearest sensitive receptor is about 63 dBA.

The applicable criteria for this analysis are the City of Manhattan Beach (COMB) Noise Ordinance (the LORS) and a CEQA test of potential significance. During Energy Commission workshops for the project, the COMB noise ordinance was determined to apply in this case because the affected receptors are in that jurisdiction. The ambient noise level from the surf at the adjacent beach has been demonstrated to exceed the City of Manhattan Beach (COMB) Noise Ordinance standards. For this reason, the COMB noise standard has been interpreted in this case such that the cumulative noise level (ambient plus power plant) cannot exceed the ambient noise level plus 2 dBA. The CEQA test of potential significance is an increase of 5 dBA over ambient noise levels. Therefore the COMB standard is the more restrictive criterion.

Determination of the ambient noise level remains an undecided issue in this case. However, the data presented to date indicate that the ambient noise level in the vicinity of the nearest residences is probably no lower than 52 dBA during the quietest time of night with low surf conditions. Using that assumption, the cumulative noise level would remain at 63 dBA.

The predicted value indicates that the cooling tower noise levels would exceed the noise standards of the COMB Noise Ordinance at the nearest residences. The cooling tower noise levels at the nearest residences would also exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess potentially significant noise impacts. Mitigation measures would be required to achieve compliance with the LORS.

Noise Mitigation

It is possible that additional noise reduction could be realized by the use of barriers. For example, a barrier could be placed at the south property line; its required height would depend on the heights of the towers, and their relative locations and elevations. A well-designed barrier could reduce cooling tower noise by up to 15 dBA, which would achieve compliance with the LORS. It is not known whether it would be feasible to provide barriers in this case.

An alternative fan design may also reduce cooling system noise levels. For example, "super-low-noise fans" such as those manufactured by Howland, are reported to be feasible, and are more efficient than low-noise or conventional (propeller-type) fans, so that less energy is required to operate the fans. Super-low-noise fans, in conjunction with acoustically treated gearboxes and related equipment, may reduce cooling tower noise by up to 20 dBA, as compared to standard fans. If this amount of noise reduction were achieved, the cumulative noise level would be about 53 dBA, which would comply with the LORS. However, if super-low-noise fans were to be used, the size of the array would probably have to be increased, as compared to a standard design.

According to the Applicant's noise consultant for the Morro Bay power plant project, water feed pumps associated with the use of cooling towers can be significant noise sources. The feed pumps would be located near the cooling towers, near the ground surface.

In general, noise due to pumps, motors and gearboxes can be significantly reduced by enclosing or lagging those sources, or by using special mounting systems. The noise reduction provided by these measures would be relatively small, compared to barriers and alternative fan designs, but would be essential elements of an overall noise mitigation program. These measures are expected to be feasible.

Conclusion for Noise

The predicted noise levels associated with the hybrid cooling alternatives are potentially significant in terms of both LORS compliance and the threshold that staff uses to determine whether additional assessment of changes in ambient noise levels is required. The identified noise impacts could be reduced to an insignificant level if barriers, "super-low-noise" fans, and other common mitigation measures were found to be feasible.

VISUAL IMPACTS OF HYBRID COOLING

Based upon a conceptual plan of proposed hybrid cooling towers (see Section 3), such a system would consist of two five-celled cooling towers measuring 50 feet x 250 feet, with a top-of-cell height of approximately 70 feet. Based upon the conceptual site layout provided, base elevations of the two structures would be approximately 39 feet and 25 feet mean lower low water (M.L.L.W.) respectively. Thus, absolute height of the two cooling tower structures would be approximately 109 feet and 95 feet respectively. The structures would thereby extend above Vista del Mar (elevation approximately 90 feet) by between 5 feet and 19 feet in the vicinity of the current tank farm.

In the segment of Vista del Mar between 43rd Avenue in Manhattan Beach and the vicinity of existing ESGS Units 3 and 4 there currently exist extensive uninterrupted views of the Santa Monica Bay and seaward horizon. Assuming the estimated cooling tower heights described above, the result of this alternative would be substantial view intrusion and view blockage of these scenic ocean views.

Visual Impacts of Cooling Towers

The following Key Observer Points (KOPs) are described in detail in the Staff Assessment visual analysis and depicted in **VISUAL RESOURCES Figure 1**.

KOP 1 – Dockweiler Beach. The potential effect of the proposed cooling towers from Dockweiler Beach would be minimal. The structures would be visually subordinate to the existing Units 3 and 4, which would partly obscure them. Overall visual change from this viewpoint would be weak. Though susceptibility to visual impact is high from this KOP, anticipated impacts of the cooling tower structures would be negligible.

KOP 7 – Bike Path West of ESGS. Like the proposed generation Units 5 through 7, the new cooling tower structures would affect a portion of the view visually dominated by the existing ESGS and adjoining tank farm. Because visual quality of this portion of the view is already poor due to the strong dominance of the existing power plant and tank farm, impact susceptibility of the setting is low to moderate. Potentially strong levels of overall visual change due to the new cooling towers would thus represent an adverse but less than significant impact.

KOP 8 – Vista del Mar. The new cooling tower structures would extend up to 19 feet above Vista del Mar, introducing a strong level of contrast, dominance, and view blockage as seen by motorists on Vista del Mar, and resulting in a strong level of overall impact. Given the moderate-to-high level of visual susceptibility (sensitivity) of the Vista del Mar KOP, this strong level of adverse visual change would represent a significant adverse visual impact. It would also exceed the CEQA Guidelines significance criterion of "a substantial adverse effect on a scenic vista" as a result of this degree of view intrusion.

Potential mitigation options for KOP 8 would consist principally of lowering the absolute height of the proposed structures so as to avoid or minimize view blockage from Vista del Mar. Cooling tower heights could be reduced by reduction in cell height, lowering of grade, or use of more numerous, smaller-sized cells (Schoonmaker, Tel. conv., Feb. 16, 2002). In addition, siting of the cooling towers as far to the east as feasible would reduce likelihood of view intrusion. The effectiveness of such measures to achieve less than significant levels of impact would require closer study based upon the exact modified cooling tower height, siting and configuration. If, however, overall cooling tower height could be reduced to approximately 50 feet (the approximate height of existing storage tanks in the location of the proposed towers) above existing grade (approximately 39 feet M.L.L.W.), then view blockage would be substantially reduced, and impacts would be reduced to a less than significant level.

KOP 9 – El Porto; KOP 2 - Manhattan Beach. The cooling tower structures would be roughly 22 feet taller than the existing oil storage tanks, which would be removed. Their length (approximately 250 feet) would be comparable to the diameter of the existing tanks (approximately 220 feet). Their general visual character would be similar in many ways to the existing storage tanks in the tank farm area, i.e., monolithic, relatively featureless and utilitarian. However, they would be located substantially farther away from these southerly viewpoints than the nearer of the existing storage tanks, and consequently would be of smaller visual scale as seen from this area. Contrast, dominance, and view blockage would thus be weak when judged against the existing baseline condition, and impacts of the cooling towers would be less than significant.

Vapor Plume Impacts

The hybrid cooling system proposed here incorporates a plume abatement design. Staff's experience on other recent, similar coastal projects also suggests that vapor plumes are generally mitigable to less than significant levels through use of plume-abated hybrid wet/dry cooling systems, as reviewed here, with appropriate specified design and operating parameters specifically aimed at plume abatement. In such systems dry cooling may be used to augment wet cooling during periods most conducive to visible plume formation, eliminating those large plumes that could create adverse impacts. If hybrid cooling towers are implemented at this site, staff recommends that independent visible plume modeling by CEC staff be conducted, and that appropriate mitigation measures be imposed to ensure adequate abatement of visible plumes, with subsequent monitoring to verify the effectiveness of those measures.

LORS Conformance

California Coastal Act

As discussed elsewhere in this Staff Assessment, coastal power plant projects are subject to conformance with requirements of the California Coastal Act, and to review by the California Coastal Commission, under Section 25529 of the Warren-Alquist Act and Section 30413(d) of the Coastal Act. Section 30251 of the Coastal Act states that "the scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas."

Although review of the proposal by the California Coastal Commission would be necessary to make a determination, Energy Commission staff believe that the proposed cooling towers as described above would not conform to the requirement that proposed development 'be sited and designed to protect views to and along the ocean and scenic coastal areas…' (Coastal Act, Section 30251).

Mitigation Measures for California Coastal Act Compliance

If cooling towers were sufficiently reduced in height as to avoid substantial blockage of ocean views from Vista del Mar, it is possible that the towers, in themselves, could be found to conform to this requirement of the Coastal Act. Other requirements of Coastal Act Section 30251, including the requirement "to restore and enhance . . . degraded areas," would continue to apply to this (ESPR) site, with or without the cooling towers, since in either case the site would continue to be a "visually degraded area."

City of El Segundo

Policies of the City General Plan address scenic and visual issues within the industrial coastal zone for the purposes of the City's certified Local Coastal Program. These include the following land use elements of the General Plan:

- **Policy LU5-2.1.** New industrial developments shall provide landscaping in parking areas and around the buildings. This landscaping is to be permanently maintained.
- **Policy LU5-2.2.** All outdoor storage shall be properly screened by masonry walls and landscaping.
- **Objective LU5-3.** Encourage the rehabilitation of existing substandard blighted industrial areas through the combined efforts of private and public sectors.
- **Policy LU5-3.1.** Revitalize and upgrade industrial areas which contain aesthetic or functional deficiencies in such areas as landscaping, off-street parking, or loading areas.
- **Policy LU7-2.2.** Continue long-term programs in conjunction with Southern California Edison and the Los Angeles Department of Water and Power for eventually placing all utilities, that they are responsible for, underground.

The requirements of these polices have been addressed under Conditions of Certification described in the Visual Resources SA. These same conditions, including such measures as perimeter and parking area landscaping, painting of new project structures, architectural screening of exposed mechanical equipment, and night lighting measures, would also be required under this alternative. With those measures, the alternative would comply with applicable City policies.

City of Manhattan Beach

Despite its proximity to residents of Manhattan Beach, the proposed ESPR, including features of the hybrid-cooling alternative, would be constructed entirely within the City of El Segundo; thus policies of the City of Manhattan Beach would not apply.

Conclusions for Visual Resources

As discussed above under the analysis of KOP 8, vapor plumes, and LORS conformance issues, the project as described could result in significant adverse impacts under CEQA, and non-conformance with Section 30251 of the California Coastal Act. It is also staff's opinion that with feasible available mitigation measures, these potential impacts could be reduced to less than significant levels, and that conformance with the Coastal Act could be achieved.

If the Applicant were to amend its proposal to include hybrid cooling, the Applicant would be required to submit a detailed proposal necessitating additional staff review. Staff would analyze this proposal at that time. Because the specific project characteristics are not known at this time, no Conditions of Certification are presented here. However, it is assumed that staff would recommend specific Conditions of Certification during review of an amended application in order to address potential visual impacts and LORS conformance issues related to pipeline construction, new structures, and/or potential visible vapor plumes as a result of the amended proposal.

AIR QUALITY IMPACTS OF HYBRID COOLING

Construction Impacts

In addition to reclaimed water pipeline construction-related emissions and impacts (addressed in Section 4), hybrid cooling towers would require site preparation and equipment activity to construct the tower, and would produce PM10 emissions during operation. Construction emissions and impacts, and operational impacts for a hybrid cooling system are difficult to predict without very specific design information, which is not available. There are very few hybrid cooling towers installed from which to draw upon, however some assumptions can be made to at least estimate the potential operational air emissions and impacts. Because the cooling towers themselves would occupy about 25,000 square feet (over 0.5 acre), it is reasonable to assume that the construction emissions and impacts would be increased at the project site if a cooling tower were constructed in addition to the construction elements already proposed. Therefore, Staff would expect there to be increased PM10 and NO2 emissions, resulting in PM10 impacts and possibly NO2 impacts relative to the Ambient Air Quality Standards. Construction emissions from the project alone (without a cooling tower) were predicted at 99% of the NO2 standard. Additional NO2 emissions on-site during construction could cause ambient NO2 to exceed the standard.

Operational Impacts

The suggested ESPR hybrid-cooling tower, at 97% wet and 3% dry, would have a circulating water flow of approximately 76,400 gpm. The hybrid-cooling tower recirculating makeup water would be reclaimed water. (Whether it was tertiary or secondary treated would not significantly affect TDS of the water.)

Staff assumes that the TDS of the recirculating water is 6,600 and 70,000 ppm. The drift rate of the cooling tower is assumed to be 0.0006 percent of the circulating water flow. With use of reclaimed water, staff estimates the PM10 emissions to be 1.52 lbs/hr (or 6.65 tons/year).

There have been no modeling efforts that specifically call out the impacts from the cooling systems alone. Therefore staff has made several simplifying assumptions and estimated the emission impacts for the 24-hour ambient air quality standard. Staff assumes that the air will be very stable (stability class D) and wind speeds will not exceed one meter per second. Staff also ignores the plume rise from the heat of the vapor emissions. Based on these assumptions, staff estimates that the 24-hour PM10 emission impact using reclaimed water is 5.6 $\mu g/m^3$. These emission impacts will likely occur near the project fence line and decrease with distance from the project site. However, since the 24-hour and annual ambient air quality standards for PM10 are currently exceeded at the project site, staff would consider these PM10 emissions to be significant if left unmitigated.

Summary

PM_{10} operational emissions and impacts are presented in **EL SEGUNDO COOLING OPTIONS Table 4** below. The use of reclaimed water in a hybrid cooling system will result in the same construction emissions as the reclaimed-once through cooling option (construction of the pipelines) in addition to the on-site construction of the cooling system. However, these construction impacts will not overlap in any way, so table shows only the construction emissions/impacts for the on-site activities.

EL SEGUNDO COOLING OPTIONS Table 4
PM10 Operational Emissions and Impacts

Cooling Options	Emission (lbs/hr)	Max. Impact	Total Impact	Percent of Std
Hybrid-Reclaimed	1.52	5.6	74.6	149

All impacts are in units of µg/m^3.
Notes:
Background 24-hour PM10 concentration is measured at 69 µg/m^3.
Percent of Std is based on the California Ambient Air Quality 24-hour PM10 standard of 50 µg/m^3.

6 CONCLUSION: COMPARISON OF COOLING OPTIONS

Sections 4 and 5 of this report describe the potential impacts of once-through cooling using reclaimed water (using different levels of treatment and different discharge points) and hybrid-cooling using reclaimed water. Either of these options could replace the proposed once-through cooling using seawater for the ESPR project. This study was undertaken because of potential significant impacts from the latter on marine biological resources. Following is a summary of conclusions.

ONCE-THROUGH COOLING USING RECLAIMED WATER

Staff finds that the use of reclaimed water in once-through cooling appears to be a feasible technology in this situation. The most significant issues raised in the use of reclaimed water in the very large volumes required here are the cost of the water itself and, in the case of the use of tertiary treated water, the capital costs of a treatment facility. Typical prices for tertiary treated reclaimed water would be prohibitively expensive in this situation, and the WBMWD has not published a rate for secondary treated water. These options could be implemented only with specially negotiated rates.

The environmental and engineering disciplines can be divided into two groups: those with the potential for significant impacts, and those in which impacts are easily mitigable or less than significant. Disciplines in which impacts would be less than significant for the use of reclaimed water for once-through cooling are the following:

- Terrestrial Biological Resources
- Cultural Resources
- Hazardous Materials Management
- Land Use
- Noise
- Public Health
- Traffic and Transportation
- Socioeconomic Resources
- Visual Resources
- Waste Management
- Water and Soil Resources
- Worker Safety and Fire Protection
- Power Plant Reliability

Potential impacts from once-through cooling with reclaimed water are of most concern to marine biological resources as described below. Staff has also indicated concerns about power plant efficiency. In addition, construction-related air emissions would be considered significant if not mitigated. Each of these concerns is summarized below.

- **Marine Biological Resources:** The use of reclaimed water to cool Units 5, 6, and 7 would significantly reduce impingement and entrainment effects as compared to the existing condition. If tertiary treated water is used for once-through cooling and discharged using ESGS intake and/or outfall pipes, the number of planktonic organisms killed by exposure to the heated discharge from the outfall would be expected to be much less than the number of planktonic organisms killed by entrainment in the once-through cooling system proposed by the Applicant. If treated water from the Hyperion WTP is used to cool Units 5, 6, and 7 and then discharged through the existing Hyperion outfall seven miles offshore, minimal impacts to marine resources would be expected. Impacts of impingement and entrainment from Units 5, 6, and 7 would be eliminated and the increased temperature of the discharge water would not add significantly to the existing impacts of the Hyperion discharge. Also, as stated in the **Water and Soil Resources** discussion in Section 4 above, discharge of heated secondary or tertiary treated water through either ESGS or Hyperion WTP would require a new or modified NPDES permit. Staff concludes that the use of treated water from the Hyperion WTP with subsequent discharge through the Hyperion outfall is the cooling alternative that would have the fewest adverse impacts to marine organisms.
- **Air Quality:** Construction of large pipelines to and from the Hyperion WTP could create significant PM_{10} impacts. These impacts may be mitigable to less than significant levels but this cannot be assured without specific information on construction equipment, scheduling, and dust control measures.
- **Power Plant Efficiency:** The use of reclaimed water for condenser cooling would be less efficient than the use of seawater because reclaimed water is warmer and a smaller quantity would be used. Staff believes that the lowest flowrate (70 mgd) would create an unacceptable efficiency reduction (approximately 4 to 6 percent); for a flowrate of 150 mgd, the efficiency reduction would in the range of 0.5 to 4 percent, which is considered to be acceptable given the benefit to marine biological resources.

HYBRID COOLING

Hybrid cooling at the ESGS site would require placement of cooling towers in locations that would require redesign of significant project components, as described in Section 3 of this report. These design challenges are substantial, and because of the concerns of nearby residents and jurisdictions, they may not be surmountable obstacles. Regardless, in order to provide information to the public and decisionmakers, the potential impacts of this conceptual design have been analyzed in the land use, noise, visual, and air quality issue areas. Potentially significant impacts have been identified in noise, air quality, and visual resources, but it is believed that feasible mitigation could reduce these impacts to less than significant levels. Summaries of those impacts follow.

- **Noise:** The hybrid cooling option is expected to produce noise levels exceeding LORS. Therefore noise mitigation would be required. Feasible mitigation measures appear to be available, though a detailed engineering analysis would be required to reach a definite conclusion in that regard.

- **Visual Resources:** The proposed cooling towers would extend up to 19 feet above Vista del Mar, resulting in substantial view intrusion and blockage of scenic ocean views from Vista del Mar. Mitigation measures to reduce this impact to a less than significant level, and which appear feasible pending further detailed study, would consist principally of various means to lower the absolute height of the cooling towers to below the elevation of Vista del Mar so as to avoid or minimize view blockage from the roadway. With this measure potential impacts from hybrid cooling structures would be reduced to less than significant levels, and would appear to CEC staff to conform with applicable portions of the Coastal Act. The latter determination, however, would be made by the Coastal Commission. The feasibility of this measure would need to be confirmed through additional studies of more specifically defined towers.

  The potential for impact from the vapor plume should be verified through modeling. Staff's experience on other similar coastal projects suggests that potential vapor plume impacts would be mitigable to less than significant levels. With recommended Conditions of Certification, the mitigated cooling towers would appear to CEC staff to comply with Section 30251. However, determination of compliance would be made by the Coastal Commission.

  Applicable LORS of the City of El Segundo have been addressed by recommended Conditions of Certification for the Applicant's proposed project. If these measures were conditioned to apply to the cooling tower alternative as well, the alternative would conform with these LORS requirements.

- **Air Quality:** PM_{10} emissions from construction of the proposed cooling tower and reclaimed water pipeline, unless mitigated, would exacerbate existing exceedances of the 24-hour and annual ambient air quality standards for PM_{10}. Also, NO_2 emissions during construction may exceed standards.

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